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* Illustrated.

THE necessity for giving more attention to the sanitary condition of railway coaches is forcibly presented in an article by J. T. Ainslie Walker on another page. If the medical authorities can agree on a suitable preparation, which it is practicable to apply for disinfecting the cars, the railways will undoubtedly be more than willing to make efficient use of it. Three roads have recently made provision for more aggressive measures along sanitary lines by the appointment of medical officers to take charge of such work. The next logical step, after the passenger car situation has been attended to, will be a consideration of box and refrigerator cars which are used for the transportation of food products. Such cars, which are not sealed when empty, are often entered by trespassers whose condition is anything but sanitary, and frequently are misused by the more ignorant classes of employees. They are also sometimes contaminated by perishable goods in an advanced state of decay. No provision is made for guarding against infection from these causes, or for properly cleansing the cars before they are again loaded with foodstuffs. How this may be accomplished effectively will be an important problem for the new school of medical or sanitary officers to solve in a practical manner.

MANY railroad officers who have risen to the position of superintendent or higher have stowed away a collection of worthless stock certificates. This collection represents "investment" in wild-cat schemes of one kind or another. The same thing is true of thousands of Americans who have worked their way up to business positions corresponding in salary with that of superintendent on a railroad. But this loss of savings seems especially unnecessary in the case of railroad men. A banker advising a client about investments will make a sharp distinction between investments that are proper for a business man and that are proper for a widow or other person entirely dependent on income from investments. Investments for the latter will yield not much over 4½ per cent.; for the former 5½ to 7 per cent. Most railroad men are business men in the sense that they are not dependent on their income from investments. If a railroad man invests in securities of a semi-speculative character of his own company or of a competitor, he is in a far better position to watch his investment closely than is the ordinary non-railroad man who is working for a salary, and who invests in railroad securities. The advantages of having railroad officers invest in railroad securities is tritely apparent. But how many superintendents have gone or written to the financial vice-president of their company and asked for advice as to investments? The mere thought seems radical and against accepted practice. Yet the treasurer or financial vice-president of a large road is in an exceptionally good position to recommend investments. Of course all sorts of objections at once present themselves, the most obvious being that if the investment turns out badly the investor will be inclined to hold his adviser responsible. But many of the same difficulties suggest themselves in the management of a pension fund, and in practice they do not prove to be formidable. The treasurer of one of the largest railroad companies in the country makes investments for the pension fund of his company every few months, and while, of course, he cannot make what would be called a business man's investments, he can and does use his position and knowledge to make the most profitable investments possible. Would it not be feasible to let it be known among officers of the rank of superintendent or above that if they cared to write to the treasurer or to the financial vice-president and ask definite questions in regard to an investment in any of the securities of their company they will receive an answer telling them what are the advantages and disadvantages of the particular investment?

COMPARISONS of statistics regarding accidents occurring under widely differing conditions may not be highly instructive, but they may not be without significance. Accidents on railways, excepting those to trespassers, are largely due to shortcom-

ings of the managements or employees. Those occurring in city streets are due directly to the carelessness or recklessness of those suffering or causing them, and indirectly to inefficient government. Some interesting comparisons can be made between the fatalities caused by accidents in the streets of New York City in the calendar year 1912, and those occurring on the entire railway system of the United States in the year ending June 30, 1912. The number of passengers killed in all train accidents was 139; the number of people killed by automobiles in New York City was 221. The number of railway passengers killed from all causes was 318; the number of persons killed by automobiles and street cars in New York City was 355. The number of passengers and railway employees on duty killed was 3,238; the number of persons killed by automobiles, trolleys and wagons in New York City was 532, or 16 per cent. as large. The total number of passengers and employees killed, including employees not on duty, was 5,151. In other words, although the railways hauled one billion passengers a total of about 35 billion miles, they killed fewer passengers in train accidents than were killed by automobiles in New York City, and fewer altogether than were killed by automobiles and trolley cars in New York City; and although they had working for them 1,700,000 men, there were 10.5 per cent. as many people killed in the streets of New York City alone as there were killed of both passengers and employees in the entire country. It may not be amiss to add in this connection that while the railways killed an average of 29 people a day, 15 of those killed each day were trespassers whose deaths were due to the failure of the governments of this country to make and enforce proper laws. It may not be amiss to add further that while the railways were killing an average of 29 persons a day, only 14 of whose deaths can possibly be attributed to their fault or that of their employees, there were being committed in the entire country over 9,000 homicides, or an average of 25 a day, all of which, like the deaths of the trespassers, were due to inefficient government. When the number of people killed in the streets of a single city exceeds the total number of passengers killed on 245,000 miles of railway; when the number of trespassers killed on railways exceeds the total number of all other persons killed on railways; when the number of homicides in the country is 80 per cent. greater than the number of fatalities that can, on any construction of the facts, be attributed to the fault of railways and their employees, it would seem that the governments of this country might well devote a little more time to regulating their own shortcomings and a little less time to regulating the shortcomings of the railways. But that would not help to "keep the bunk in bunkum."

THE LESSONS OF THE FIREMEN'S CONTROVERSY.

THE firemen have won over the managers of the Eastern railways in the controversy about the way their differences shall be arbitrated. The railways made the firemen three propositions. First, they offered them advances in wages relatively the same as those awarded to the enginemen by the board of eminent citizens that arbitrated the enginemen's case. Second, they offered to submit the controversy to arbitration by a board similar to that which arbitrated the enginemen's case. Third, they offered to submit the matter to arbitration by a board composed of two representatives of labor, two representatives of the railways and two disinterested persons. All these propositions the firemen rejected. They offered the railways the alternative of arbitration under the Erdman Act or a strike.

That the firemen have won is not because their side of the case was more skilfully handled than that of the railways. It was not. Never, we believe, has the railway side of any labor controversy been handled better than was done in this case by Elisha Lee and his associates. The firemen won because they had the greater brute force and the greater disposition to use it regardless of consequences.

The result contains three lessons which it behooves the people of the United States to learn.

First, the physical power of the railway brotherhoods exceeds that of the railway managers. Of course the railways could lock the employees out, just as the employees could strike; but the railways have much more to lose by suspension of operations.

Second, the brotherhoods occupy a better strategic position than the railway managements do. This is because the managers have had many collisions with public opinion in which they have been worsted; and it has taught them that in all their acts they must respect the rights of the public. One of these rights is to have transportation maintained without interruption. The employees fully appreciate the position the managers are in. They have not had similar collisions with public opinion in which they have been worsted. Therefore they have not been taught to respect the rights of the public, and some of their organizations do not respect them. In this instance and in many others, they have shown that when regard for the rights of the public becomes incompatible with resort to a strike to secure what they demand, they will trample on the rights of the public and declare the strike. They recognize the responsibility of the managers to the public. They do not accept any responsibility on their own part to the public. Naturally this gives them a great advantage over the managers.

The third lesson which the public needs to learn flows naturally from the first two. It is that the public should adopt some means for protecting its rights against those who have both the power and the disposition to trample on them. The existing law, as the developments in this and many other cases have indicated, is insufficient to protect the rights of the public. There was nothing in the Erdman Act to prevent the firemen from striking, and they doubtless would have struck, and brought down on the public all the direful consequences, if the managers had not yielded. Furthermore, there is nothing in the Erdman Act to insure that mediation and arbitration under it will result in fair adjustments of wages and conditions of employment. It is just as essential, in the long run, that railway labor controversies shall be settled on a right basis as that they shall be settled at all. If wages and conditions of employment are made unreasonable, the cost of rendering the service of transportation will be made unreasonable and the rates that the public will have to pay for it will be made unreasonable.

The managers showed great forbearance and great public spirit by yielding, to prevent a strike—a public spirit strikingly contrasting with the selfish and reckless contempt for public rights and the public welfare displayed by Mr. Carter and his associates. Perhaps it might have been better for the public, in the long run, had the strike come; for then the demonstration of the need for additional legislation regarding the labor situation on railways would have been complete.

ON THE EFFICIENCY OF AMERICAN RAILWAYS.

WE publish on another page a letter in which Professor Cunningham of Harvard University criticizes some of the statistics used by James J. Hill in his recent address before the Railway Business Association. Mr. Hill sought to show that the efficiency of the railways of the United States is higher and their rates lower than those of the railways of Europe. Although one of the world's greatest experts in devising and using statistical units adapted to indicate and promote efficiency of operation, Mr. Hill seems, in this instance, to have fallen into some inaccuracies. But we do not believe, and we do not think Mr. Cunningham believes, that any such errors made by Mr. Hill were sufficient to affect the soundness of his conclusions.

Mr. Cunningham criticizes Mr. Hill's use of the number of tons hauled one mile per dollar of net revenue as an index of efficiency. He points out that net revenue is made up from both passenger and freight receipts. Because of differences in the ratios of passenger to freight traffic handled, in the wages paid, etc., it is very hard to make satisfactory comparisons indicating the efficiencies of the railways of different countries. The greatest economy is secured by handling traffic in the largest

units. It is easier, however, to increase the size of the units in which freight is handled than in which passengers are handled. The railways of the United States handle their freight with the largest and most powerful locomotives, the largest cars and in the largest trainloads, of any railways in the world. Among the railways of Europe the Prussian-Hessian are their closest rivals in this respect. The densities of freight traffic on the Prussian-Hessian roads and ours are about the same, but the average freight trainload in this country in 1909 was 363 tons, and in Prussia-Hesse only 233 tons. Unlike conditions may explain part of this difference, but they will not explain anywhere near all of it. On the other hand, the Prussian-Hessian lines handle over 50 per cent. more passengers per train than our railways. But, as Professor Cunningham shows, their density of passenger traffic is 400 per cent. greater than that of our railways, and 85 per cent. of it is second and third class, while practically all of ours is first class. They apparently do handle their passenger traffic more economically; and in view of the facts they certainly ought to.

Mr. Cunningham criticizes Mr. Hill's use of average rates per ton per mile to indicate the relative costs of transportation to the public. It is true that many allowances and qualifications must be made in using ton mile rates as evidence of actual rates. Mr. Cunningham mentions the most important of these. After all the necessary allowances and qualifications have been made, however, the reasonable and candid student must conclude that the freight rates of the United States and of Canada, where American methods are used, are the lowest in the world. We have never heard of any such student reaching any other conclusion.

It is also true, as Mr. Cunningham says, that in considering the cost of transportation to the public, passenger as well as freight rates must be included. The average passenger rate in the United States is relatively high. But average passenger rates as well as average freight rates must be used with many allowances and qualifications. In their case also the densities of traffic, the lengths of haul and the conditions of service must be considered. Furthermore, it must be considered that in this country the railway will carry a maximum of 150 lbs. of baggage free for each passenger, while in Europe the carriage of baggage must be paid for. Persons who have kept account of all of the expenses of railway travel under like conditions in Europe and the United States find that it is no more expensive in the United States than in Europe. Charles Frederick Carter contributed to the *Review of Reviews* for May, 1912, an interesting article on "Cost of Travel at Home and Abroad." He gave exhaustive illustrations all leading to the same conclusion. One was the case of an American traveler who kept an account of his expenditures on eleven journeys in Europe aggregating 2,154 miles. He never rode in a "train de luxe"; but he paid out in fares $76.55; and for the transportation of baggage weighing 168 lbs., $19.42; a total of $95.97, and an average of 4.46 cents a mile. On returning home he made a schedule of eleven journeys in the United States with an aggregate mileage of 2,211 miles. For these trips the total cost of one-way tickets and parlor car tickets was $60.15. The addition of a possible excess baggage charge of $2.75 increased the total to $62.90, making an average of 2.86 cents a mile, or $33.07 less than the cost of the European trips.

Considering both freight and passenger rates, the charges of the Prussian-Hessian railways are the lowest, on the average, in Europe. One way to reach an approximately correct conclusion as to the relative costs of passenger, express and freight transportation in Prussia and the United States is to apply the average passenger and freight rates of Prussia to the traffic of the railways of the United States. The earnings per mile of the railways of the United States in 1910, from freight and passenger business were $10,769.48. The addition of the revenue of both the railways and express companies from express, increases this to $11,377. Our density of freight traffic was 1,071,086 ton miles, and our density of passenger traffic 138,169 ton miles. While the earnings of both the express companies and the railways from express have been included in these earnings per mile, it is not possible to include the express density in the traffic figures, because it is not known. The average rate per ton per mile in Prussia, where express is included in freight, was 1.37 cents; the average passenger rate, 89 cents. If these rates had been applied to our freight and passenger traffic in 1910, the earnings per mile of our railways from freight and passengers alone, including nothing for express, would have been $15,903.57 per mile. This is over 40 per cent. more than actually was earned from freight, passengers and express, including the earnings of the express companies. In other words, with a freight traffic density approximately the same as that of our railways, with a passenger density over 400 per cent. greater, the average rates of the Prussian-Hessian lines were so much higher that their application to the passenger and freight traffic of our railways would produce 40 per cent. larger earnings than are actually received by our railways and the express companies from passengers, freight and express. And while allowances are being made for differences in the hauls and character of the traffic, allowance should also be made for the fact that while the average daily compensation of the employees of the Prussian-Hessian railways in 1910 was only 80.7 cents, the average daily compensation of the employees of American railways was $2.29, or 184 per cent. greater.*

Similar and even stronger comparisons, all pointing to the relative efficiency of our railways and the lowness of their rates, might be made between them and the railways of other European countries. If such comparisons do not settle whether the railways of the United States are more efficiently and beneficially managed, from the standpoint of the public, than are those of Europe, we are unable to imagine what evidence would. However, as we said at the start, Professor Cunningham does not question Mr. Hill's general conclusions; we are quite sure he agrees with them. And we have said what we have to supplement what Mr. Hill said, and not to controvert what Mr. Cunningham says.

ON TELLING ALL THE FACTS.

WE publish on another page a letter signed "New York," commenting on the editorial in our issue of January 31, entitled "Some More Reasons Why Railways are Unpopular." "New York" is the chief passenger officer of a large railway system. He concedes that the service given to railway passengers is not 100 per cent. perfect. He believes, however, that it comes nearer being so than that given to the public by commercial hotels, government institutions, etc.

We hasten to subscribe to "New York's" views. We did not imply that railway service in this country is not as good as that rendered by other concerns or institutions with whose service it can be appropriately compared. There is not a complaint that can be made about the service on sleeping cars and dining cars that cannot be made with equal force about the service given in even the best hotels in the United States. The most uncivil railway ticket clerk is a perfect gentleman compared with the average hotel desk clerk. Furthermore, telling the truth is somewhat characteristic of railway employees, while veracity among hotel clerks is apparently a rare commodity. Was there really ever a case at a large hotel in the United States when a traveler was promised that he would be transferred to a room with bath in case he would first take a room without a bath that he ever got the room with a bath? There are very few hotel proprietors in the United States who could not learn a good deal about how to serve their patrons by visiting the hotels run by the railway companies in Canada, the Fred Harvey hotels on the railways in the Southwest, and some other railway hotels that might be mentioned.

Another place patronized by the public where the service given is as bad as the worst service on railways is the theater. In the large class of lordly and insolent whippersnappers those who sell

*Bulletin No. 34, Bureau of Railway Economics, page 40.

tickets at theater box offices easily rank first. The patron who is charged $2 for seeing the kind of shows given at most "first class" play houses is entitled to courteous treatment. If he should get that, it would, in many cases, be all he got for his money. But he seldom receives the courteous treatment, and he often has to go out and buy tickets from a scalper at a large advance in price. It is easy to imagine what the public would say and do if the employees of railways treated their patrons as the employees of theaters treat theirs, and, if, in addition, the railways let a large share of their transportation and sleeping car tickets fall into the hands of scalpers who made the public pay extra for them.

As to the service given to the public by employees of national, state and municipal governments, to which our correspondent alludes, it is probably the worst of all. The mail carrier on your route is usually very obliging and civil. He is a cheering and outstanding exception to the rule; and even mail carriers are not always polite. As to the general run of government employees, if the citizen desires to know how obliging and courteous they are, let him go to the city hall to pay his taxes, or to the federal building to get information. He will soon learn that government exists, not as the great Declaration says, for the benefit of the governed, but for the benefit of their employees. Some people think railway service in this country would be improved under government ownership. After thirty years of public operation of the old State railway system in France and four years of public operation of the Western Railway in that country, M. Guyot, formerly Minister of Public Works of France, writes: "It has set up a class of workmen and employees who consider that the line is run for their benefit and not for the convenience of shippers or travelers."

But—the *Railway Age Gazette* is a publication devoted to railway transportation. It considers it to be its function to do what little it can in a modest way to improve railway service. Suppose railway transportation is 75 per cent., or 80 per cent., or 90 per cent. efficient. We deem it our function to comment on the 10 or 15 or 25 per cent. of inefficiency as well as on the 75 or 80 or 90 per cent. of efficiency; and such comment does not imply that the efficiency of railway service is less than that of other forms of service rendered to the public. It is unfortunate that when a journal or a man devoted to the interests of a particular line of business tries to tell 100 per cent. of the truth about it, those whose attitude toward that business is critical or unfriendly are more likely to believe the comments made which harmonize with their own views than those which run counter to them. Fortunately, on the other hand, most people are disposed to be fair, and 100 per cent. candor inspires confidence and belief in fair people. Therefore, it is to the selfish interest of railways that all those who wish them well shall try to tell, not merely the facts, but all of the facts about them. Furthermore, that is the only square thing to do.

Recognizing and conceding our great limitations, both in point of ability and virtue, we venture to set down that this is the policy that this paper is trying to follow. God forbid that we should offer up the prayer of the Pharisee; but we can't help adding that while we are trying to tell what is bad as well as what is good in the railway business, there are many other publications that would show more consistency, if not more of a still greater virtue, if they would try to tell what is good as well as what is bad in the railway business.

NEW BOOKS.

Diary of a Roundhouse Foreman. By T. S. Reilly, Bound in cloth. 158 pages. 5 in. x 7 in. Published by the Norman W. Henley Company, 132 Nassau street, New York. Price, $1.00.

The book is published in the form of a diary and gives in colloquial form the experiences and trials of the engine house foreman. The hero of the story is a young college graduate who is serving his apprenticeship and has endeavored to push his way to the top. Many suggestions are given for the diplomatic handling of men.

Letters to the Editor.

TRAIN-ORDER SIGNALS NORMALLY AT STOP.

New Orleans, La., January 28, 1913.

To the Editor of the Railway Age Gazette:

The "slogan" of today in railroad circles is "Safety First"; and in some states, this one for example, the railroad commission is demanding that roads not equipped with block signals shall increase the number of telegraph offices, especially night offices, in order that trains may be better spaced. Whether this is or is not done, there is one thing that should be done at once; keep the signals normally at stop. To keep them at "proceed," as is done at present invites disaster. I can recall a number of serious collisions that would have been prevented had the semaphores displayed stop instead of proceed, caused by operators taking train orders for trains which had passed their station. It is the rule that despatchers shall not place a restricting order at a station for a train where there is any doubt as to the train having passed, or by the average running time could have passed the station; but the rule is often ignored. The normal position of the semaphore was changed from stop to proceed, not with the view of increasing the safety of trains; but with the idea of eliminating the stops caused by operators when there were no orders for trains and no reason for spacing; or to allow agents more time to attend to station work outside of the office. On the road with which I serve, on one district alone, within the past month, four trains have passed stations without the knowledge of the operators, the operators reporting the trains as "not yet by." Subscriber.

SOME REASONS WHY RAILWAYS DO NOT GIVE 100 PER CENT. SERVICE.

——, February 10, 1913.

To the Editor of the Railway Age Gazette:

Referring to the editorial in your issue of January 31, entitled "Some More Reasons Why Railways Are Unpopular," I am not an apologist for incivility or inefficiency; the facts are indisputable. It is not practicable anywhere in life to receive 100 per cent. of the time 100 per cent. of efficiency from 100 per cent. of employees, nor can you get the maximum efficiency 100 per cent. of the time even from the 100 per cent. man, and in whatever degree the capacity of the human machine falls below the 100 per cent. maximum standard, he gives less than 100 per cent. of efficiency some or all the time.

Let me illustrate by concrete examples I can vouch for personally, and a large portion prove by a witness:

Thursday, January 30, 1913. United States city of 425,000. Breakfast at one of the three best hotels: waiter service attention inferior; coffee inferior; food and cooking good. Lunch at same hotel: waiter service attention very inferior; food and cooking good; coffee inferior. Dinner at another of the three hotels: waiter A1; food and cooking excellent; coffee a grade above lunch and breakfast.

November 13, 1912.—United States city of 2,500,000. At a high class hotel that really tries to give excellent service. Breakfast, all good except leathery toast served, although prior instructions to waiter specified precise wishes, i. e., that toast be freshly made and hot. Bath tub plug unserviceable; could not retain water in tub.

November 14, 1912.—Same hotel. Hat girl gossiping with captain at dining room door; paid no attention whatever until called. Breakfast, all good except toast, which was the other extreme—hard as a board, could not be eaten readily.

Now, Mr. Editor, while the foregoing items are not too serious to me, I have heard a railway meal service damned altogether for less. I am not necessarily a crank; but I am cranky enough to be able to observe inefficiency wherever it comes within my observation. In the course of nearly forty years' railway service,

and, I believe, considerably more than one million miles traveling—at least ten of those years living all the time in hotels, sleeping and dining cars—I feel fairly qualified to give the opinion that man for man and place for place the railway and its employees compare favorably with the average commercial house and its employees, and excellently well with governmental service and employees, federal, state or municipal.

It matters much how the railway employee is addressed and what is the physical and mental condition of the inquirer. Not every man is gifted with inexhaustible patience to answer with unruffled serenity *all* the questions asked; and the way some are put, the hectoring bully, the nervous woman, the utterly inane, almost insane, slush that is dignified by being called "a question" or "an inquiry!" I was through the mill as a ticket clerk, and writhed and suffered and still kept civil, and today careful inquiry shows that after four decades the same exacting public exacts still more than when I was a lad, and our boys have just the same kind of heterogeneous collection to deal with.

Pardon me for taking so much space, but there are two sides to every phase of these matters, and there is as much fault on the part of the public as of the railways. NEW YORK.

THE LESSON OF IRVINGTON.

CHICAGO, January 29, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have been reading your editorial of last week, page 133, telling, under 18 heads, the causes of the collision on the Cincinnati, Hamilton & Dayton. You say that railroad officers will need no assistance in making use of this lesson; but it seems to me that it is somewhat of a mixed problem, or at least that there is room for quite a lot of discussion as to what action should be taken on some of the points in your list. Looking at one's own road and the conditions actually on hand to be dealt with, the question whether a certain duty is up to the employee, or to the supervising officer, or to the directors of the company, sometimes admits of more than one answer.

The causes of this collision, as outlined by you, are: (1) The block system was not arranged to protect against opposing movements; (2) because of bad judgment or overloaded trains, engines became stalled on hills; (3) the engineman covered the headlight prematurely; (4) the engineman started to close the switch, but did not carry out his purpose; (5) the switch was not lighted; (6) Gross made a positive statement when he had as a basis only a supposition; (7) the passenger engineman did not slacken speed; he should have done so because of the absence of the light; (8) the lamp had failed; (9) the engineman was specifically responsible, according to rule 104 A; (10) the conductor and each of two brakemen attended the switch at different times, but no one of the three cared enough about the light to relight the lamp; (11) the company allows disregard of the rule prescribed to insure the safety of trains when lights do not burn; (12) the failure of lights is frequent; (13) trains have to double hills frequently; (14) the engineman was not sufficiently experienced; (15) the brakeman was not sufficiently experienced; (16) the fireman was not sufficiently experienced; (17) the speed as limited by a city ordinance was exceeded by the passenger train; (18) the electric headlight of the passenger engine was out of order and a poorer light or no light had been put in its place.

Where lies the responsibility? Item 17 surely should be referred to the president of the road. Where a city imposes a speed limit of 30 miles an hour three or four miles out in the country, the absurdity of the situation ought to be apparent, even to an alderman; and it is the duty of a railroad company to do everything practicable to get such an ordinance changed. If a change cannot be had, the road must obey the rule; or, if it deliberately decides to defy the law, it is due the trainmen to explain to them the company's attitude. Breaking a law habitually, the officers set a very bad example, particularly if the reasons for their decision are obscure or are kept secret.

The 18th item is troublesome, also. The slowness of shop foremen (often due in large measure to difficulties with help for which the foreman is not responsible) and an unwise policy as to carrying a sufficient supply of repair parts, in many cases seem to combine to neutralize the value of the large sums of money that have been spent for high-power headlights. If legislatures with their crude measures are going to prescribe headlights, there would seem to be necessary still another law to provide for state inspection or periodical inquiry to see that the lights actually are used with regularity and effectiveness.

Item 8, keeping switch lights burning, is another difficult point. The percentage of switch lights failing is exceedingly small, and yet the few failures that do occur make much trouble. Perhaps, if the Indiana rule requiring trains to stop and revive dead lights could be generally enforced the imperfect lights would make still more trouble, and then somebody would be disturbed sufficiently to produce an actual reform. Keeping lamps cleaned, filled and provided with good wicks, properly adjusted, is not a difficult task; but it *is* a difficult task to get trackmen who will be 100 per cent. efficient in this work. The proper remedy, it seems to me, is not to make trains stop for dead lights, but to have all switches protected by distant signals, so that safety will be insured simply by reducing speed. Reducing speed would not impose very serious delay, while yet the inconvenience would be sufficient, if all cases were promptly reported, to force somebody to take action.

Items 3 and 9 are plainly up to the engineman. Items 5 and 6 are equally clear; there is no excuse for this plain shiftlessness. Item 10 is equally conclusive against the conductor and the two brakemen, both of whom, I understand, had had occasion to turn the switch; but consideration of the cases of these three men only brings out in strong light the need of much more detailed, minute and rigid supervision of all of the work of men who, like these, are out of sight of their boss all the time. In the case of men—quite as intelligent as freight conductors—in offices and shops the need of admonition, instruction, reproof or exhortation is evident every day; and yet we go on blindly trusting freight train men to do their work entirely in accordance with their own individual judgment. That they will do many things wrong is a foregone conclusion.

In all the other items of this indictment it is the officers, not the employees, who have got to do the house cleaning. Indeed, every ambitious superintendent or trainmaster will feel a personal relation to every item of the whole 18; for, whatever the shortcomings of his men, he means to cure all shortcomings if he can discover how to do it. But as to items 1, 2, 7, 11, 12, 13, 14, 15 and 16, who will raise any question? Every now and then some accident shows a general laxity throughout the service. This seems to be one of that kind. Our problem is not an "accident problem"; that is a misleading term. It is the problem of good management, and mainly one of good management of men. Is it not time that we got away from this attitude of the governmental authorities, always looking at symptoms, and turn our attention to more constructive ideas? Good management is always a duty, even if no accident ever happened, and if good management be constantly striven for the accident record, after a time, will be reduced, so that no official will need to lie awake nights worrying about his responsibility for it.

It seems to me that the most significant items in this list are the last three—14, 15, 16; three inexperienced men. Would not the correction of these features surely have prevented the accident? Without doubt. Who will boldly adopt a rule that *no train of any class*, no light engine even, shall ever be run over the road except with thoroughly tried men in charge? Thorough trying out will involve much apprenticeship and a decided increase in expenses; but shall we ever secure safety without adequate attention to this feature? Why should not every division superintendent at once present to his general manager an estimate of the cost of so enlarging his working force of enginemen, firemen and conductors as to provide for all emergencies. AN ASSISTANT TO.

A CRITICISM OF JAMES J. HILL'S STATISTICS.

CAMBRIDGE, Mass., January 15, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In his remarkable address before the Railway Business Association recently (*Railway Age Gazette*, December 20, 1912), James J. Hill has made a masterly presentation of the railway situation, and has set forth strong and convincing arguments to show that the one paramount need of the railways is greater terminal facilities. Mr. Hill's opinions are held in highest regard both in and out of railway circles and his statements command the greatest respect, since hardly anyone is better acquainted than he with the details of operation and the large matters of administrative policy of American railways. It is, therefore, with some hesitation that the writer ventures to call attention to the doubtful use which Mr. Hill has made of statistics of foreign railways to illustrate his address, particularly those applying to Germany. Similar mistakes and omissions are occasionally noted in the statements of other railway officials of high standing, and it may be of interest to call attention to some features which deserve attention in the interpretation of statistics of European roads.

The figure most commonly misinterpreted or misapplied is that giving the average revenue per ton mile. This unit for the United States in 1910 was 0.753 cents; in Prussia-Hesse in the same year it was 1.37 cents; and on the North Eastern Railway of England, the only line in England computing ton-mile statistics, it was 2.30 cents in 1909. It is frequently concluded that the British shipper pays freight rates which are 206 per cent. higher than the rates in this country; and the shipper in Prussia is charged 82 per cent. more. Such a conclusion, however, is faulty. In the first place, neither England nor Prussia have express companies. Their freight traffic includes the smaller packages which in this country go by express, and in England, particularly, the freight service between all important points moves with a speed and regularity that resembles passenger service. To make a fair comparison between the ton-mile rates of the United States and these foreign countries it is necessary to add to our ton mileage and revenue the tonnage moved by the express companies and the revenue therefrom. Ton-mile statistics are not computed by the express companies, but a recent study made by the Interstate Commerce Commission established the fact that for three selected months the average revenue *per ton* was $30.80, the average distance carried not being given. But whatever may be the express ton-mile rate, it would undoubtedly tend to increase the average freight ton-mile rate considerably.

In the second place, the English freight rates (on which the North Eastern ton-mile revenue is based) include a charge for the collection and delivery of freight at originating point and at destination. In this country the railways do not collect and deliver like the express companies, and if this expense were added to our average ton-mile rate the effect would be startling. Every condition favors the United States in the usual basis of comparison, since we have a higher percentage of low grade freight taking low commodity rates (much of which moves by water in Europe) and our haul is five times as long as on the North Eastern of England, and twice as long as in Prussia. Consequently, our terminal charges per ton-mile are less.

A comparison between countries on a passenger-mile revenue basis is fairer than the ton-mile unit, but even in this case one fact is often overlooked. In this country a generous proportion of our travelers ride in parlor cars. The extra charge for this privilege goes to the Pullman company and is not included in the passenger-mile rate. In England and Germany the first-class carriages are equivalent to our parlor cars and their passenger revenue units include the excess charges to travelers who use the first-class cars. A very few parlor cars are now being introduced in England, but they are unknown in Germany. To make a proper comparison of the passenger-mile revenue in the three countries it would be necessary to make some allowance for the 0.5 cent per mile additional paid in the United States by passengers who use parlor cars. The average revenue per passenger mile in 1910 was 1.938 cents in the United States and 0.89 cents in Prussia-Hesse. The figure for Great Britain is not available. It is evident from the very low passenger rates in Prussia that the passenger traffic is carried at or below cost, and the administration necessarily must recoup itself from the freight service, in which the rates are relatively higher. The tabulation which follows shows the normal rates and the division of the passenger traffic in Prussia-Hesse in 1910:

Class.	Normal Rates per Passenger Mile. Slow Trains.	Fast Trains.	Per Cent. passenger miles in each class.
First class	2.68c.	2.79c.	0.89
Second class	1.72	1.84	11.00
Third class	1.15	1.22	39.51
Fourth class	0.766	....	44.59
Military	....	....	4.01

As already stated, the Prussian first class corresponds to our parlor car; their second class is as good or better than our modern coaches; their third class is not quite as comfortable as our very old coaches, and we have nothing that compares with their fourth class, in which the great majority of passengers are obliged to stand. First class compartments are designed to seat four passengers; second class, six passengers, and third class, eight passengers.

The figures which Mr. Hill uses for traffic density do not agree with those of other authorities. His estimate for Great Britain (it must be an estimate since ton mileage is not computed except on the North Eastern) is 529,622 ton miles per mile of line. A recent bulletin of the Bureau of Railway Economics gives the North Eastern density as 814,713. Mr. Hill's figure for Germany is 827,400, but the official statistics of the *Reichs-Eisenbahn-Amt*, 1910, give 933,569 metric tons, which is equivalent to 1,029,000 tons of 2,000 lbs. The latter figure is but slightly less than the ton-mile density of the United States, which in 1910 was 1,071,086.

The density of passenger mileage is of equal interest since it must be taken into account with the freight density and the two balanced if we are to form an intelligent opinion of the relative performance. The following tabulation shows that Prussia exceeds the United States in both freight and passenger density, but if the comparison is narrowed to Group 2 (comprising roughly the States of New York, New Jersey, Pennsylvania and Delaware) a territory more nearly like Prussia, the showing is more favorable to the highly developed Eastern section of this country. In Group 2 the passenger density is less than one-half that of Prussia, but the ton mileage is 143 per cent. greater. The figures are for 1910.

	Ton miles per mile of line.	Passenger miles per mile of line.
United States	1,071,086	138,169
Prussia-Hesse	1,150,490	693,921
Group 2, U. S. A.	2,797,011	314,187

As a proof that the railways of the United States have been capably managed, and their resources and powers used to the highest business advantage, Mr. Hill calls attention to the fact that in the United States we move 272 tons one mile for every dollar of net revenue, while Germany moves only 172, France 88, and Great Britain but 58. This unit of comparison is misleading, since net revenue is made up of receipts from both passenger and freight transportation, and the ratio of one to the other, and the units of revenue, differ widely in the several countries named. In the United States 23 per cent. of operating revenue comes from passengers; in Prussia-Hesse, 29 per cent.; in France, 33 per cent.; and in Great Britain, 38 per cent. It would be as fair to express the relation between passenger miles and net revenue, and point to the showing as evidence that our resources and powers are *not* used to advantage. In the United States, for each dollar of net revenue a passenger is moved 32 miles; in Germany, the distance is 97 miles, or three times as far. Neither comparison, however, is of any practical value.

WILLIAM J. CUNNINGHAM,
Assistant Professor of Transportation, Harvard University.

THE NEEDS OF THE RAILWAYS.*

What Can and What Cannot Be Done by the Railways Themselves to Offset the Increasing Expenses of Operation.

By Samuel O. Dunn,
Editor of the *Railway Age Gazette.*

When I speak of the needs of the railways I do not mean what they need to serve themselves. I do not even mean what they need merely for their own profit, the good of their employees and the benefit of those who travel and ship. I mean what they need to promote the interests, not only of those having investments in railways, but also of the much larger number having investments in other enterprises; not only what they need for the good of those who work for them, but also what they need for the good of all who work at all; not only what they need for the benefit of the relatively few who travel much, but also what they need for the benefit of the many who travel little or none; not only what they need for the benefit of the relatively few who ship, but also what they need for the benefit of the many who produce and consume what is shipped.

The prime requisite of good transportation is safety. Our railways are less safe than they ought to be. Their accident record is often exaggerated and misrepresented. But without exaggeration or misrepresentation it is bad enough.

The accidents on American railways are usually discussed as if they were a distinct disease. They are less a disease, perhaps, than a symptom. We are rather notorious for accidents in all our industrial pursuits. We have a bad name for automobile and other casualties in our city streets. We have more homicides and fewer punishments for them than other leading nations. The diagnosis all these symptoms suggest is that, for temperamental or other reasons, we as a people tend to act in disregard of our own safety and the rights and safety of others. They suggest that we have not been apt, either in our industrial organizations or our governments, in devising means for controlling those of a reckless and unruly spirit.

The problem of dealing with trespassing is the problem of dealing with more than half of all the fatalities on our railways; and as long as it is handled as it is now by the governments there will be no reduction in the deaths of trespassers, which now number over 5,000 a year.

Probably three-fourths of all accidents, except those to trespassers, are due to railway employees incurring risks in ignorant or intentional disregard of the operating rules, and to the failure of the managements to give the instruction and training and administer the discipline necessary to stop these things. It seems possible, however, that some form of government regulation may be required to reduce these man-failure accidents. In England railway operating rules when filed with and approved by the Board of Trade acquire the force of law. The same thing is true in our own state of Indiana as to rules filed with the state railroad commission.

The classes of accidents already referred to, constituting together a very large majority, are not remediable by physical improvements in the railways, but only better laws, better railway rules and better enforcement of and obedience to them. There are, however, many accidents that can be reduced only by physical improvements which will cost very large amounts.

ARE FACILITIES INADEQUATE?

Next to safety the most important requisite of good transportation is adequacy. There is much complaint that at certain times the freight service of our railways is inadequate. In 1906, 1907, and again in 1912 we have been seriously troubled with what are called "car shortages." The situation last fall was not as bad as it was in the years 1906 and 1907, but it would have been worse if the fall and winter had not been remarkably mild.

The statistics show that these so-called car shortages are usually comparatively brief. They commonly begin around October 1, reach their maximum late in that month or early in November, and disappear before January. The largest net shortage was in February, 1907, and amounted to 137,847 cars. The next largest was that of October, 1907, reaching 82,811 cars; and the third largest that of November, 1912, amounting to 51,259 cars. On the other hand, the net surpluses since 1907 have usually exceeded 100,000 cars, have often exceeded 300,000, and have been as much as 400,000. Furthermore, the shortages are not of annual occurrence, while large surpluses are.

These figures show that the trouble has been merely that our railway facilities have been unable to carry the peak of the load. Now, which involves the greater economic loss to the country—to have transportation facilities that are inadequate to handle the maximum traffic, or to have facilities which are in excess of the requirements most of the time? It is generally accepted in business that it is best to have your plant large enough to handle the regular maximum business satisfactorily. Doubtless, the same principle applies here.

The congestion of traffic in 1906 and 1907 came at the end and climax of a period of industrial and commercial expansion, during which traffic had increased greatly and railway construction and the purchase of equipment went forward rapidly. The congestion of traffic last fall came at the end of a period of comparative business depression, during which there was relatively little construction of new lines and purchasing of new equipment, and at the beginning of what promises to be another period of great industrial and commercial development. Much of the equipment is now in a condition of relative depreciation which will make it necessary soon to replace it. This combination of conditions suggests that unless rapid increases in the facilities of the railways are made we may in a very few years be confronted with a congestion of traffic even worse than that which lasted from the fall of 1906 until June, 1907.

MOST ECONOMICAL MEANS OF INCREASING CAPACITY.

The most economical way to increase the capacity of a railway is, when practicable, to increase the capacity of its cars and the power of its engines. Cars of large capacity and engines of great power together make it possible to handle a given traffic with a minimum of trains; and the fewer trains you run the more traffic you can handle with a given mileage of main tracks.

American railways have acted on these principles more effectively in the handling of freight than any others. They increased the average capacity of freight cars from 28 tons in 1902, to 36 tons in 1910, or 21.4 per cent. in eight years. The Prussian-Hessian state system, which is the leader of Europe in economy of operation, increased the capacity of its cars from 14.1 tons in 1900 to 15.5 in 1909, or less than 10 per cent. The average capacity of its cars is less than one-half as much as ours, and it increased in nine years less than one-half as much in proportion as did ours in eight years. We have no figures regarding the average seating capacity of passenger cars in this country. On the Pennsylvania Railroad it increased from 57 in 1900 to 63 in 1909, or 10.5 per cent. The increase in the same years on the Prussian-Hessian Railways was from 46 to 49, or 6.5 per cent. The average tractive power of the locomotives on the railways of the United States increased from 20,485 pounds in 1902 to 27,282 in 1910, or 33 per cent., and far exceeds the power of the locomotives of any other railways.

The result of this combination of increases in car capacity and

*From an address delivered before the Graduate School of Business Administration of Harvard University, Cambridge, Mass., December 4, 1912.

locomotive power in the United States was large increases in the tonnage and the passengers hauled per train. The average number of tons per train in 1900 was 271, and in 1910, 380, an increase of 40 per cent.; and the increase in passengers per train was from 41 to 56, or 36 per cent. The Prussian-Hessian railways increased their train load from 163 tons in 1900 to 233 tons in 1909, or almost 40 per cent. The percentage of increase in their train load in nine years was as great as that in ours in ten; but our train load was substantially larger at the beginning of the period than theirs was at the end, and was 63 per cent. greater in 1910 than theirs was in 1909. They increased their number of passengers per train from 80 in 1900 to 84 in 1909, or 6.3 per cent.

The additions to the average train load have been made possible, of course, not merely by the increases in the capacity of cars and the tractive power of engines, but also by many reductions in grade and curvature, and much strengthening of track.

The operating and financial results gained by the means outlined have been notable. The mile of line is the unit of railway operation. The number of tons of freight hauled one mile per mile of road grew 45.3 per cent. between 1900 and 1910. This more dense freight traffic was handled with an increase in the number of freight cars per mile of road of 25 per cent., and an increase in freight train mileage per mile from 2,557 to 2,683, or but 3 per cent. Between 1900 and 1910 the increase in the density of passenger traffic was 60.5 per cent. This largely increased traffic was handled with an increase in the number of passenger cars per 100 miles of road of but 8.3 per cent., and an increase in the number of passenger trains run one mile per mile of line of from 1,887 to 2,279, or 21.7 per cent. It was possible, owing to the increases in train loads, to handle the large increases in freight and passenger traffic with an addition of but 2.9 per cent. to main traicks per mile of road, and an addition of only 8.7 per cent. to the mileage of all tracks per mile of road. There were large increases in the prices of materials and the wages of labor, and these tended to increase operating expenses. The increase in operating expenses per mile was from $4,933 in 1900 to $7,658 in 1910, or 55 per cent. The increase in the cost of road and equipment per mile was from $56,567 to $63,631, or 12.4 per cent. In other words, on each mile of road there was handled an increase of 45.3 per cent. in freight traffic, and of 60.5 per cent. in passenger traffic, with an increase in expenses per mile of 55 per cent., and an increase in investment per mile of 12.4 per cent. The increase in the freight density of the Prussian-Hessian roads between 1900 and 1909 was from 889,441 ton miles to 1,069,743 ton miles, or 20.3 per cent.; the increase in their operating expenses per mile was from $10,373 to $14,527, or 40 per cent.; and the increase in their cost of construction per mile from $98,050 to $110,727, or 12.9 per cent. On comparing the figures for the nine-year period 1900-1909 in both the United States and Prussia-Hesse, we find that the freight density of our roads increased 29.7 per cent. and that of theirs 20.3 per cent.; that the operating expenses of our roads increased 37.2 per cent. and those of theirs 40 per cent.; and that the cost of road and equipment of our roads per mile increased 9.7 per cent. and that of theirs 12.9. It is probable that meantime the increase in the density of our passenger traffic was about as great in proportion as in theirs, although their passenger density in 1900 is not available.

CAN CAPACITY CONTINUE TO BE SO ECONOMICALLY INCREASED?

What has been said shows the way the capacity of our railways has been intensively increased in the past and the results gained. It also shows that their intensive capacity must be further greatly and rapidly augmented. Can this further increase in capacity be attained by the same methods, and with the same economy as past increases?

It would seem that the extent to which the capacity of some kinds of cars can be increased in future is somewhat limited. Furthermore, commercial conditions prevent increasing the average load per freight car in proportion to the average capacity per car. Attempts to increase minimum carload weights always call forth protests and opposition. How great are the practical obstacles to increasing freight car loading is illustrated by the fact that, while between 1902 and 1910 the average capacity per car increased 21.4 per cent., the average loading increased only from 17 to 19 tons, or less than 12 per cent. There is no question, however, that, without any increase in the present capacity of cars it would be commercially practicable to greatly increase their average loading; and this would be, in effect, to increase the freight carrying capacity of the roads in the most economical way possible.

There are practical limits to the increases that can be made in the capacity of passenger as well as of freight cars, and more especially in their loading. Travelers in this country demand a large amount of car space and usually get it. On one of the large western trunk lines the average number of passengers per car in 1902 was 11, and in 1912 only 13, although meantime the density of its traffic and the size of its cars had largely increased.

There are obstacles to the utilization of the increased capacity of engines as well as cars. The longer freight trains are made the more trouble there is from buckling and draw-bars pulling out. The longer trains require longer passing tracks; and there is greater difficulty in handling them at yards and terminals. Railway train employees are hostile to the handling of extremely long trains with ordinary-sized crews, and in many states are getting legislation passed to increase the size of crews. This, of course, tends to nullify one of the main advantages of running long trains, viz., the saving in labor cost. In Arizona the people by referendum ballot at the last election adopted a law to prohibit the operation of freight trains exceeding 70 cars. There are also commercial difficulties. To secure large average freight train loads it is necessary to have much low grade traffic so situated that it can be conveniently assembled in large quantities at certain points, and then moved slowly in large solid trains for substantial distances; and these conditions do not obtain on all roads.

The practical difficulties to increasing passenger train loads are still greater. The public demands more and more frequent service; it insists on trains being run on fast schedules; and both these things hinder increases in passenger train loads.

The practical obstacles to increasing train loads in proportion to the power of locomotives are illustrated by the fact that while the average tractive power of the locomotives of our railways increased 33 per cent. between 1902 and 1910, the average number of tons per train increased only 28 per cent. and the number of passengers per train only 24 per cent. The difficulty of increasing passenger train loads beyond a certain point is especially great The railways of Interstate Commerce Commission Group II have a passenger traffic density 129 per cent. greater than the average in the United States, yet they carry only 12.5 per cent. more passengers per train than the average. The railways of Prussia-Hesse in 1909 had a passenger traffic density over 430 per cent. greater than that of our railways, or 675,023 passenger miles per mile as compared with our 127,299; and 60 per cent. of their passengers were third class, while practically all of ours are first class; yet they carried only 85 passengers per train as compared with our 54, or only about 52 per cent. more. Because of the fact that increased passenger traffic cannot be dealt with with anything approaching a proportionately increased train load the economies that can be introduced in handling it are incomparably less than that that can be made in the handling of freight.

The differences between the train loads on different roads are very large, and indicate that many railways, by reducing their grades, strengthening their tracks and buying more powerful locomotives, can materially increase them. All that it is meant to indicate here is that progress in this direction in future may be less rapid in proportion than it has been in the past.

EXTENSIVE ADDITIONS AND IMPROVEMENTS NEEDED.

If my reasoning is correct, it will be necessary in future to make larger proportionate increases in the amount of equipment and the number of trains run to handle the increased freight

business. Our passenger traffic has in recent years been increasing faster in proportion than our freight traffic. This, doubtless, will continue to be true. The number of passengers carried per car and per train has not been, and, doubtless will not be, susceptible of as great increase in proportion as the tons hauled per car and per train. Therefore, the increase in the amount of passenger equipment that will have to be provided and in the number of passenger trains that will have to be run will be even greater in proportion than the necessary increases in freight equipment and freight trains.

With the amount of equipment now handled and the number of trains now run, tracks and terminals are overtaxed. Therefore, we must have more tracks per mile of line; and if the amount of equipment and the number of trains run must in future increase faster in proportion to the traffic than they have in the past, then it follows that there must in future be larger increases in our miles of track per mile of line in proportion to the increase in traffic than there have been in the past, and that these increases must be made both in main tracks and in yard tracks and sidings.

There is one class of improvements in passenger service which the public especially demands, and which should be mentioned here because of their great cost. These are improvements in passenger stations and terminals. These improvements are made, not only to increase the convenience and comfort of beginning and finishing railway trips, but also to gratify the civic pride and aesthetic tastes of the people of the different communities. Some of my economist friends question whether there is a public demand for such large expenditures as are made on passenger terminals and whether they are economically justifiable. They may not be economically justifiable; but it is certain that there is a public demand for them.

There is needed extensive, as well as intensive, development. There are large parts of our country in which mileage should be increased. During the half-decade ending with June 30, 1906, the total mileage increased 5,300 miles per year, while during the half-decade ending with June 30, 1911, it increased only 4,231 miles per year. While there is this need for new construction in certain sections, the need for intensive development now exceeds that for extensive development.

The provision of the facilities needed will require a very large investment. Various estimates have been made. They range from $1,100,000,000 a year to $1,700,000,000 a year. There may have been larger. The increase in the cost of road and equipment in 1902-1907 was 21 per cent.; and at the end of the period facilities were inadequate. It is probable that in future it will be necessary to buy more equipment and build more tracks and terminals in proportion to provide for any given future increase in business than it has been heretofore. And besides, the demands for unproductive improvements to increase the comfort and the safety of transportation and the expenditures needed to satisfy them are much greater than in the past. Apparently it is conservative to say that the percentage of increase in cost of road and equipment during the next five years should be at least 40 per cent. There are no figures for cost of road and equipment later than 1910. Probably for 1912 it would be about $15,500,000,000. An increase of 40 per cent. in that in five years would be $6,200,000,000. That is a very large sum. But even if no new mileage were built, and there were an increase of 40 per cent. in the probable present cost per mile of road and equipment, it would be raised to only $90,000, or $21,000 less than that of the railways of Prussia-Hesse in 1909, $51,000 less than of the capitalization per mile of the railways of France in 1908, and $184,000 less than the capitalization per mile of the railways of the United Kingdom in 1909.

MAKING UNPRODUCTIVE IMPROVEMENTS FROM EARNING.

Railway officers contend that the unproductive improvements should be largely made from current earnings. This view has the endorsement of high authority. The board of eminent and public spirited citizens that recently arbitrated the wage controversy between the eastern railways and their locomotive enginemen said:

"Some of these expenditures (from earnings) are for the elevation of tracks through cities, the elimination of grade crossings, the introduction of safety appliances, the electrification of roads entering the larger cities, and the construction of elaborate, often monumental, terminals. While the elevation of tracks, the elimination of grade crossings, the introduction of safety devices, etc., do somewhat increase the net earning power of the road, in that traffic is more easily and rapidly handled, it cannot be said that this increase is anything like proportionate to the additional investment; yet the public demands these additions and betterments for their safety, comfort and convenience. The policy of withholding a considerable amount out of the income for additions and betterments is not criticized. Indeed, it is believed to be wise."

The earnings used for these purposes may either be surplus funds left over after substantial dividends have been paid; or they may be funds so used when no dividends, or only small ones, are paid. In the past earnings often have been used for both productive and unproductive permanent improvements; and as the arbitration board said in the report just quoted, "in many cases the 'water' put on the market has been made substance altogether by the above process, by the increasing value of real estate, especially in cities, and other factors; in other cases this has been accomplished in part. In still other cases much of the common stock does not yet represent substance." When stockholders have voluntarily gone without dividends, or accepted small ones, it has been with the expectation of getting a substantial return later from the invested earnings. They would not have released the bird they had in hand if they had not expected to get the two they thought they saw in the bush. The same thing will be true in future. And as the arbitration board said in its discussion of this subject, "If the dividends are decreased below a reasonable amount, for the sake of additions and improvements, the stockholders are justified in regarding the amount put in as their property, and therefore a basis for future dividends." If net earnings are inadequate to yield both interest and reasonable dividends and a surplus from which to make unproductive improvements, and the improvements are made from earnings which might properly be paid out in dividends and are subsequently capitalized, the effect in unduly inflating and loading down the railway's capitalization is just the same as if the unproductive improvements had been made from new capital in the first place. The conclusion is that a railway whose capitalization is reasonable ought, at least under normal conditions of prosperity, to earn and pay interest on its bonds and substantial dividends on its stock, and have besides a sufficient surplus for such improvements as should be made from earnings.

The arbitration board said in its report:

"If, on the other hand, the dividends now paid are reasonable and the additions and betterments are taken out of the income such expenditures should not be the basis upon which new securities are issued."

It certainly does seem, both in view of our past experience and as a matter of principle, that nothing should be capitalized except what represents actual risk taken or actual sacrifice made in establishing and developing the business. There is risk taken when people invest in the stock of a new railway even if they pay only $50, or even $25, a share for it; and there is sacrifice when they refrain from taking any dividends at all on an investment of only $25 or $50 a share, or only 3 or 4 per cent. on an investment of $100 a share; and we must continue to pay people in one way or another to take these risks and make these sacrifices just as long as risk and sacrifice are necessary to the development of industry; and they will be necessary as long as there is any industry left to develop. On the other hand, it is a sound principle that when a railway has paid substantial dividends and invested surplus in the property that surplus should not be capitalized, but left there to benefit the public by enabling the road to give better service and to benefit the security holders by protecting them in

bad years as well as in good in the enjoyment of their usual interest and dividends.

HOW IS NEW CAPITAL TO BE RAISED?

Practically all of the needed productive improvements and extensions should and must be made from new capital derived from the sale of bonds and stocks. The rate of interest in general has risen in recent years, and the bond market of the railways has been affected by this. Then, our railways have heretofore been financed to so great an extent with the proceeds from the sale of bonds that their funded debts are excessive in proportion to their outstanding stocks. Their net capitalization in 1910, according to the statistics of the Interstate Commerce Commission, was $14,338,575,940, or $62,657 a mile; and of this $8,811,584,162, or $38,505 per mile, or over 60 per cent. was funded debt, and $5,526,991,778, or $24,152 per mile or nearly 40 per cent. was stock. Considering them as a whole their outstanding debt is excessive in proportion to their outstanding stock. What the present stockholders need for their own good and the public's is not more creditors but more partners. For some years to come improvements and extensions ought to be, and in many cases must be, financed chiefly with capital raised by the sale of stock.

If, however, a higher rate of interest must be paid on bonds and a larger proportion of railway financing is to be done in future than heretofore by the sale of stocks it will be necessary for the roads to earn more net in proportion than heretofore to pay a return on the total investment in their properties; for in order to market stock it will be necessary to pay a dividend on it substantially exceeding the rate of interest of bonds, the reason being, of course, the larger risk involved in investment in stock.

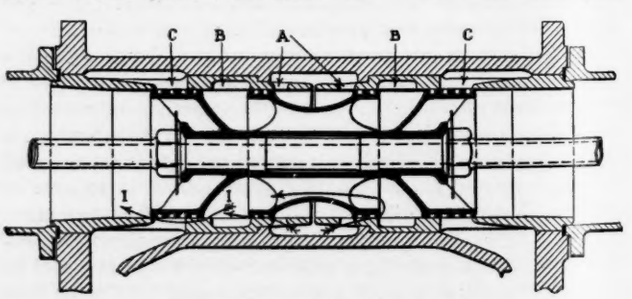
Now, are the net earnings of the railways large enough, or are they likely to become large enough, to make the improvements that should be made from earnings, and to pay a proper return on the present capital and the needed additional investment of capital? In 1900 the net operating income was 5.4 per cent. on the net capitalization and 4.65 per cent. on the reported cost of road and equipment; in 1905 it was 6.3 per cent. on the net capitalization and 5.26 per cent. on the cost of road and equipment; and in 1910 it was 5.7 per cent. on the net capitalization and 5.73 per cent. on the cost of road and equipment. The highest of these percentages of return seems small compared with the rates of return in other lines of industry. The average percentage of net earnings on the capital of national banks was 11.4 in 1900, 13.7 in 1905, and 16 in 1910; and the net earnings on the investment in manufactures in the same years was, 1900, 17 per cent.; 1905, 13 per cent.; 1910, 12 per cent. If one is disposed to reject these figures it would seem sufficient to say that if investment in railways had heretofore been as profitable as in other lines, the increase of investment in railways would have been sufficient to have caused their capacity to have increased as fast in proportion as the productive capacity of other industries.

There is no question that there is going to be a very large increase in traffic and gross earnings. Just how large the increase in gross will be will depend on the rates the roads are allowed to charge. Assuming any given amount of gross earnings, net operating income will depend on how efficiently the railways are operated, how much their taxes are, and what unit prices and wages they have to pay for materials and labor. With so many factors that are uncertain, evidently no one can accurately predict the future of net operating income. The extent to which expenses, and, therefore, net income depend on the efficiency of management has been brought into much prominence in recent years. It has been charged that generally speaking, the management of our railways is much less efficient than it ought to be and can be made. In the earlier parts of this paper, it has been shown that the managements have very perseveringly and effectively endeavored year after year to keep down expenses and fixed charges by increasing the capacity of equipment and the average loading of cars and trains. It is generally recognized by railway managers and students of railway operation—indeed, it is incontrovertible—that it is by these methods that the greatest economies can be effected. In view of these facts and many others that could be cited it is a little hard for one who is constantly in close contact with railway matters to believe that the railway managements have not been doing about all that has been reasonably practicable to promote economy and efficiency. During the ten years from 1900 to 1910 the average wages and prices paid increased 25 or 30 per cent., and average rates received increased very little; and yet the increase in business and economy in management enabled the roads to increase their net earnings.

The vital question regarding future operating expenses is as to whether the prices of materials and equipment and the wages of labor are going to advance, and if so, how much. If traffic should grow much and wages and prices should rise in the next decade, and there should be no increases in freight and passenger rates, it seems highly probable that the increase in operating expenses would be excessive in proportion to the increase in gross earnings; that in consequence the increase in net earnings would be inadequate; and that therefore the intensive and extensive development of the railways would be insufficient. But the conditions are now pretty generally appreciated, especially by the more important railway regulating authorities; there is a growing public disposition to question what may seem unreasonable demands regarding conditions of work and wages on the part of railway employees; there is also a growing tendency in most parts of the country to deal with railway rates in a conservative manner; and, therefore, on the whole prospects seem good that the increases in railway net earnings that are needed will occur and that the roads will be able to, and will, very greatly improve and enlarge their facilities.

HOCHWALD PISTON VALVE.

An interesting arrangement of piston valve has recently been introduced on a number of German locomotives. The peculiar features of the valve are twofold: it has the equivalent of a double port opening, similar to the Allen D valve, and it automatically decreases the piston clearance as the valve closes and increases it again for the period of compression. It is known as the Hochwald valve and is shown in longitudinal section in the engraving. It consists of an ordinary inside admission piston valve, with the ends pretty well separated and between them an auxiliary valve whose longitudinal section is similar to that of an ordinary D valve. This auxiliary valve is located in the steam space of the main valve. The main steam ports



The Hochwald Piston Valve.

are indicated at *A*, and the auxiliary valve has a bearing equal only to the lap of the valve. It is shown in its central position, with the two steam ports *A* open into its interior. The rings of the main valve at the ends cover the ports *C C*, which lead to the cylinder, and have a lap considerably less than that of the auxiliary D valve.

Suppose the valve to be moved to the left from its central position. The first event is to uncover the steam port *C* at the right, allowing the exhaust to escape. Next the lap of the valve at the left-hand end uncovers the steam port *C* at that end, and puts the whole interior of the valve in communication with the cylinder, thus increasing the end clearance of the piston

by that amount. This persists during the period of compression. When the valve has moved to the left by the amount of the lap of the auxiliary valve, the steam from the left-hand port *A* passes up and over the rings through the left-hand cavity *B* and into the left-hand cylinder port. At the same time the edge of the right-hand port *A* is opened into the interior of the valve and steam passes by this route to the left-hand cylinder port *C*. The lesser lap of the main valve causes the port *C* to be wide open while double the width of opening for the flow of steam is afforded by the two openings of the auxiliary valve.

When the valve closes, the steam is first cut off by the auxiliary valve, and expansion occurs in the ordinary way during the period elapsing up to the point when the main valve closes the cylinder ports *C*. Then the space in the interior of the valve is cut off from the cylinder and the clearance of the piston is correspondingly decreased, with a consequent rise in the expansion line of the indicator diagram corresponding to this decrease of clearance. The result is that the valve presents the advantage of an ample clearance space during compression and a small one during expansion.

TRAIN ACCIDENTS IN JANUARY.[1]

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of January 1913:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
7.	Southern; G. & F.	Hazlehurst.	xc.	P. & F.	1	0
†8.	Vandalia	Terre Haute.	rc.	P. & P.	4	17
19.	Illinois C.	Brookhaven.	bc.	P. & F.	2	5
24.	Phila. & R.	Yardley.	xc.	P. & F.	0	11
28.	Wabash	Defiance.	rc.	F. & F.	1	0

Derailments.

Date.	Road.	Place.	Cause of Derailm't.	Kind of Train.	Kil'd.	Inj'd.
1.	Ches. & O.	Huntington.	d. bridge.	F.	8	1
3.	New Orl., M. & Chi.	Leaf, Miss.	d. bridge.	P.	2	14
†7.	Cleve., C. C. & St. L.	Stockwell.	b. tire.	P.	1	60
16.	Boston & A.	Charlton.	ms.	P.	1	9
17.	Penn.	Lock Haven.	slide.	P.	0	1
24.	Illinois C.	Melvin.	unx.	P.	0	5
31.	St. Louis & S. F.	Ardmore.	.....	P.	0	8

The trains in collision at Hazlehurst, Ga., on the 7th were northbound passenger No. 5 of the Southern Railway and a freight of the Georgia & Florida. The passenger train struck the freight train on the crossing of the two roads, overturning two cars. The engineman of the passenger was caught between the engine and tender and was killed. There are no signals at the crossing. The freight had stopped before crossing, but the passenger had not.

In the rear collision at Terre Haute, Ind., on the afternoon of the eighth, passenger train No. 20, second section, eastbound, ran into the rear of local passenger train No. 8, standing in the station. Two cars of the standing train were badly damaged. Two passengers and two employees were killed and 11 passengers, 5 employees and one other person were injured. The collision was due to excessive speed of No. 20 approaching the station, and to disregard of the rights of the standing train.

The trains in collision near Brookhaven, Miss., on the night of the 19th, were a southbound express passenger and a northbound freight. Both engines and several cars were badly damaged. One engineman and one brakeman were killed, and five passengers were injured. The collision was due to a misplaced switch, the lamp of which was not burning.

[1]Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)—Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

In the collision near Yardley, Pa., on the evening of the 24th a westbound express passenger train ran into a locomotive without train and both engines and the baggage car were wrecked. Three trainmen and 8 passengers were injured. The light engine was wrongfully using a crossover on the time of the passenger train.

The trains in collision near Defiance, Ohio, on the 28th, were westbound freights. The leading train had been stopped just beyond a curve and the following one ran into it at full speed. One brakeman jumped off and was killed. The collision is charged to the flagman of the standing train, who had gone back only 850 ft., though a severe snowstorm prevailed.

The train derailed on the Chesapeake & Ohio near Huntington, W. Va., on the 1st, was a westbound freight. The engineman and seven bridge repairmen were killed and one employee was injured. The train was moving at only about six miles an hour over a bridge supported on temporary trestle work, one side of which appears to have been undermined by a flood which had raised the Guyandot river about 8 ft. This accident was reported in the *Railway Age Gazette* of January 10.

The train derailed on the afternoon of the 3rd near Leaf, Miss., was southbound passenger No. 3 and the tender and first three cars in the train broke through a bridge and fell to the swamp below. The train porter and the news agent were killed and 11 passengers and 3 employees were injured. The cause of the derailment was the failure of the piles supporting the bridge.

The train derailed near Stockwell, Ind., on the afternoon of the seventh, was westbound passenger No. 15, and two cars were wrecked. The train was running at about 60 miles an hour and the derailment was due to a broken tire on one of the wheels of the baggage car. One passenger was killed and 60 passengers and four employees were injured, two of the injured being possibly fatal.

The train derailed at Charlton, Mass., on the evening of the 16th was westbound passenger No. 39. The rear car was thrown off the track at a facing point switch, the evidence indicating that the switch was turned by a freight fireman just as the rear truck of the rear car was passing. The train was running at about 35 miles an hour and the car was thrown violently against the pusher engine of a westbound freight which stood on the side track, crushing in one side. The porter of the car was fatally injured. Nine passengers were injured, four of them seriously. The track and cars were examined after the accident and no defect found.

It was mechanically impossible for the switch to be opened without first throwing the unlocking lever situated 40 ft. east of the switch. The fireman claims to have thrown this unlocking lever, which controls the switch, as train No. 39 was passing, but denies throwing the switch. Assuming the speed of the train to have been 35 miles an hour at the time of the accident, it would have been impossible for the fireman to unlock the lever and walk to the switchstand of the switch before the rear of the train had reached that point. While the fireman insists that he did not throw the switch, yet it is impossible to reach any other conclusion. The fireman has been in the service since 1906, is a qualified engineer and had a good record up to this time.

The train derailed near Lock Haven, Pa., on the 17, was a southbound express, and the cause of the derailment was a large rock which had fallen down from the side of a mountain. The whole train, except the rear car, was derailed, and an express car was overturned, seriously injuring the messenger. The baggage car and two passenger cars fell down a bank.

The train derailed near Melvin, Ill., on the 24th, was the "Daylight Special" southbound. The train was running at about 35 miles an hour; the tender and first four cars were overturned. Five passengers were injured. The cause of the derailment was not discovered.

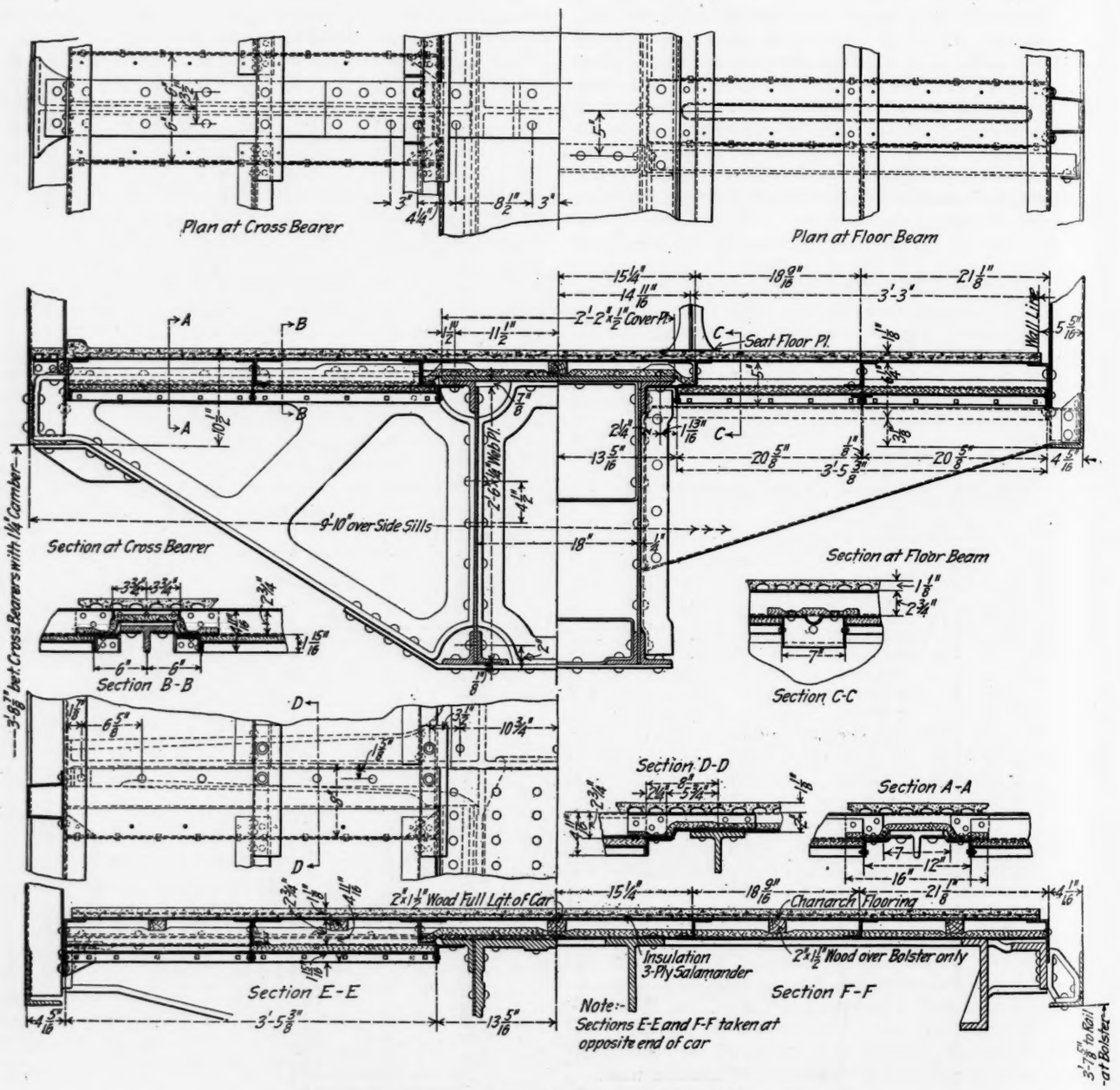
The train derailed on the St. Louis & San Francisco near Ard-

more, Okla., on the 31st of January, was passenger No. 580. The tender was the first vehicle to leave the track. All of the cars were derailed and the smoking car was overturned. Eight passengers were injured.

Electric Car Accidents.—Of the accidents to electric cars in the United States reported as occurring in the month of January, two were attended with fatal results; a slight collision on the third avenue elevated line of the Interborough in New York City, on the 25th, in which one passenger was killed, and a collision between a passenger train and a freight train on the International Interurban Railway near Lockport, N. Y., on the same day, in which the motorman was killed and 10 or 15 passengers were injured. The freight train was at a standstill on the main line about a half mile south of the station. The forward passenger car and one car of the freight were completely wrecked. On the Toledo & Western Interurban line at Toledo, Ohio, an express car, filled with merchandise, ran off the track in the street and was overturned on the sidewalk, where it took fire, from a stove inside, and was partly destroyed.

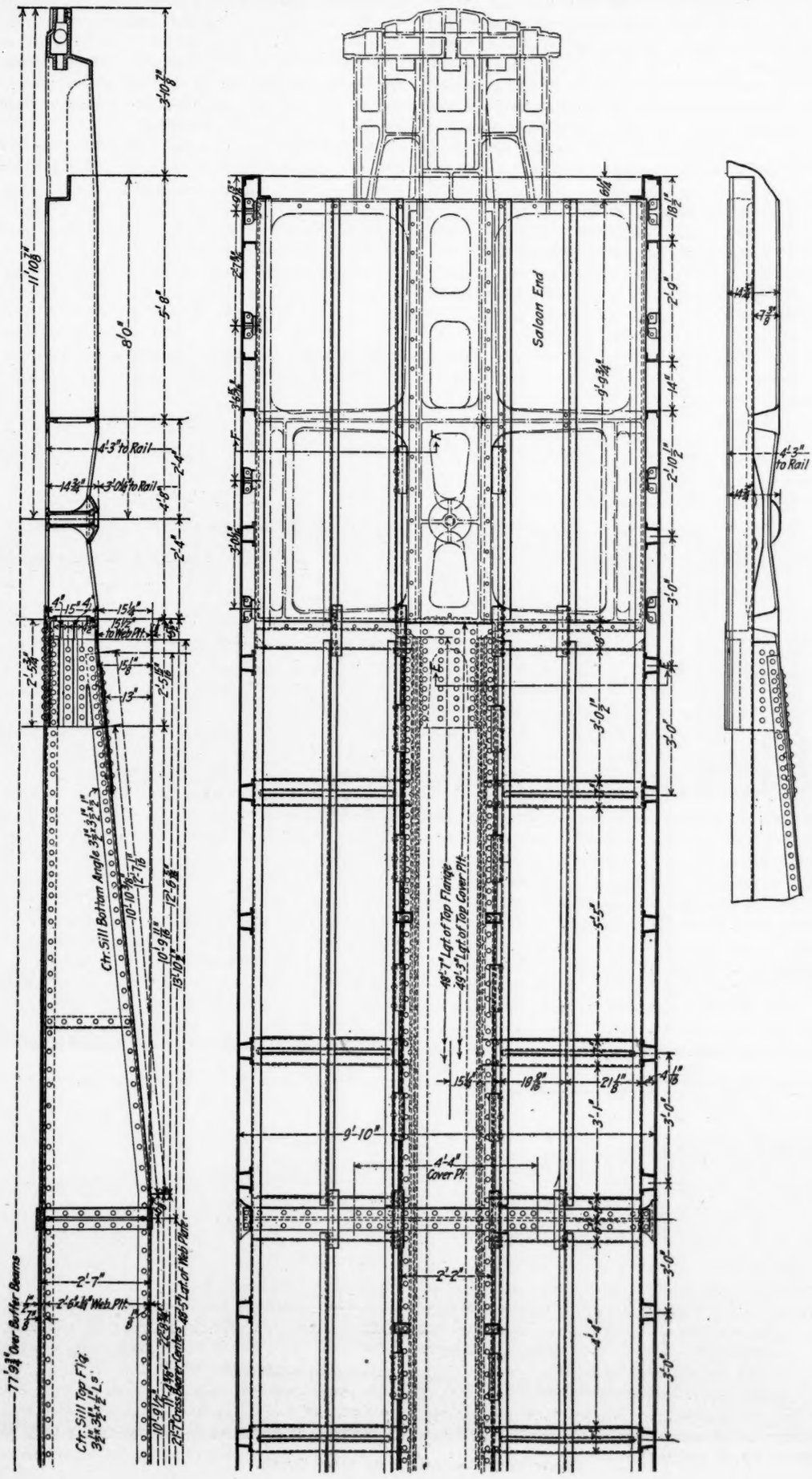
STEEL COACHES FOR THE NEW YORK CENTRAL.

The New York Central Lines have recently put in service a number of coaches which represent the most recent development in the design of all-steel passenger equipment. These cars are 70 ft. long over the end sills, 77 ft. 9¾ in. over the buffers, and are mounted on six-wheel trucks set at 54 ft. centers. They will seat 84 passengers and are particularly noteworthy for the strength of the end construction and the thoroughness of the insulation.



Details of Underframe; New York Central Lines Steel Coach.

In the underframe, Commonwealth combined cast steel double body bolsters and platforms are used, connected by fish-belly type center sills, and side sills consisting of steel angles. The center sills, which are spaced 18 in. apart, are built up of ¼ in. web plates with two 3½ in. x 3½ in. x ½ in. angles at the bottom, and one 3½ in. x 3½ in. x ½ in. angle at the top. For a distance of 22 ft. 8¾ in. at the center they have a depth of 31 in. A top cover plate 26 in. x ½ in., extends their full length.



Arrangement of Underframe Members; New York Central Lines Steel Coach.

Two cast steel cross bearers are used, with top and bottom cover plates, 6 in. x ½ in., and there are seven pressed steel floor supports of channel section on each side of the car. The outside floor stringers consist of an angle pressed from ¼ in. plate, while the intermediate stringers are of Z shape, pressed from ⅛ in. plate. The stringers extend the length of the car.

The posts are pressed from ⅛ in. steel, are of channel section with flanges, to which a 1/16 in. cover plate is riveted; a 5 in. 6½ lb. channel, extending the entire length of the car, forms the plate. The belt rail is placed outside the posts and extends the length of the car, while back of it between the posts are placed 4 in. x 4 in. x 3/16 in. pressed steel angles. The side sheathing is riveted between the belt rail and these angles.

A 6-in. Z-bar is used for the body corner post and is set in a pocket in the underframe casting at the bottom, while at the top it is secured to both the side and end plates. Back of this post is a large cast steel knee extending along the side of the car for 23½ in. and reaching as high as the belt rail. This is intended as an anti-telescoping device and was furnished by the Commonwealth Steel Company. The door posts are 6 in., 12¼ lb., I-beams and are also set in pockets in the underframe casting. They are fastened at the top to the end plate, which is a 5 in. channel placed with the web in a horizontal position. This plate is secured to the side plates and the deck sills by a gusset bracing. The intermediate end posts are 4 in. Z-bars secured at the top and bottom in the same manner as the side posts.

The vestibule diaphragm posts are 6 in. I-beams, also resting in pockets. They are supported at the top by a 5 in. channel extending back to the end frame and secured to the gusset which reinforces the end plate. There is also a similar channel secured to the opposite side of the post, which extends upward and outward to a connection at the junction of the deck end plate and side plate. The former is a 5 in. straight channel with the flanges cut away at the end and the web turned inward for riveting to the deck side plate. A diagonal brace extends from the top of the door post at this point and large gusset plates are used to make the joint rigid. In addition there is a diagonal brace from the top of the vestibule diaphragm post to the side plate near its junction with the corner post. The vestibule corner post is ⅛ in. thick, pressed to the proper contour and secured to the buffer beam extensions at the bottom, and to the side plate and vestibule end plate at the top. The latter is a 3½ in. x 3½ in. x ¼ in. angle, and is riveted to the vestibule diaphragm posts above their connection to the diagonal braces.

Special attention has been given to the insulation of the car. Next to the inside finish at all points is a ½ in. sheet of Resisto or H. W. Johns-Manville Company "Nycinsul" insulation, and on the inner face of the outer sheets a ¼ in. sheet of Resisto is applied. The latter is brought inward around the posts and other members and is joined to either the inner insulation or the wooden fastening strip which secures the inside finish. This insulation is secured to the plates by fasteners spot welded in place. There is no continuous metallic connection between the inside and outside of the car at any point, and all open spaces between the framing are carefully filled with wood blocks or other suitable material.

The carlines, both upper and lower deck, are of channel shape and are pressed from ⅛ in. plate. The interior finish is of steel, finished to imitate mahogany, except below the window sills and on the headlining, where agasote is used. The window sills and sash are of Cuban mahogany. The Gould axle system of electric lighting is employed.

The total weight of the car is 142,000 lbs., giving a weight per square foot of interior floor area of 22.9 lbs., and per seated passenger of 1,690 lbs. Both the Barney & Smith Car Company and the American Car & Foundry Company have built cars from this design, which is the result of co-operation between the engineers of the railroad company and the builders.

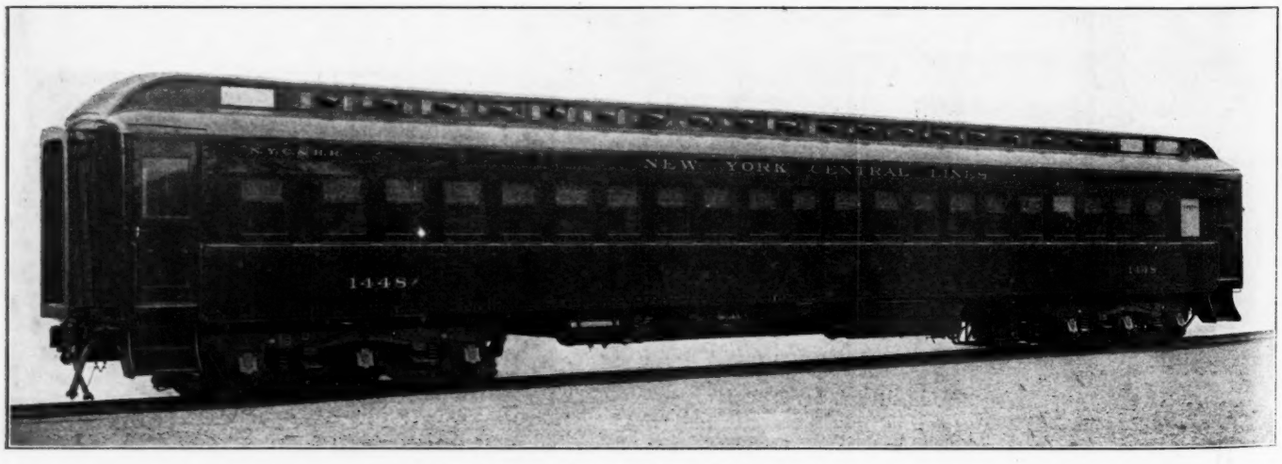
SCIENTIFIC CLEANSING OF RAILWAY COACHES.

By J. T. Ainslie Walker.

This article has been prepared in response to a suggestion made by Mr. Sherman Allen in connection with the treasury department movement to bring about better sanitary conditions on railroad cars and vessels. There are various phases presented by this problem, but the remarks are confined to one upon which I can speak with some little authority—one which, up to the present, has received little serious attention; that is that particular phase which deals with the transmission of disease through the agency of the bacilliferous dust to be found on the floors of railway cars.

The number of passengers carried in the United States exceeds 1,000,000,000 a year; and in round figures this traffic is accommodated in 50,000 cars, or 20,000 persons per car per year. There is no material available for framing any estimate of the proportion of passengers in an infectious condition. In the case of certain diseases there can be no question as to their being infectious before they can be recognized: and of so huge a total—being in fact more than 10 times the entire population of the country—it is clear that there must be a large number of cases carried in a condition of unrecognized infection. If the cars were disinfected, for example, after each journey, each passenger's risk in railway travel would be confined to his chance of sitting by the side of an infected person during the journey. As it is, in the absence of systematic routine disinfection, the risk must be enormously enhanced.

We have in fact the same sort of thing as in the process for



New York Central Lines Steel Coach.

detecting scarce bacteria in water; if a very large quantity is passed through a single filter, the deposit will contain and infect a culture tube with the organism which is being sought, where any manageable quantity of water would probably fail to do so. The deposit in the case of each railway car is the residual infection of such of its 50,000 inmates per year as may have been infected; and there must be an enormous increase of risk to individual passengers from this inevitable accumulation of infective matter over the risk which would be run if the cars were disinfected regularly.

In the course of a discussion on a paper entitled "Infection in Transportation," read by Dr. H. M. Bracken, secretary of the Minnesota State Board of Health, at the first annual meeting of the National Association for the Study and Prevention of Tuberculosis, Dr. Victor C. Vaughan of Ann Arbor, said he held it proved that railroad cars scatter infection.

Applying Disinfectant to Hudson & Manhattan Car.

Writing on "Dust and Disease," in the *American Journal of Public Health* of September, 1912, Prof. Winslow and Dr. Kligler, in referring to certain experiments conducted by Dr. Prausnitz, state that of 21 animals inoculated with dust from railway carriages, 5—or nearly 25 per cent.—developed tuberculosis, and that Dr. Kinyoun, of Washington, on several occasions found pneumococci (the organism of pneumonia) in similar dust.

A medical writer in the Philadelphia *Public Ledger* of January 13, 1913, says: "Railroad cars bear an unenviable reputation as centers for the spread of infection, and there can be little doubt of the urgent need for the adoption of more efficient methods of cleansing and disinfection—particularly the latter."

It would not be a difficult matter to adduce further evidence as to the infective potentialities to be found lurking on the floors of railroad cars, but the above should be sufficient to convince even the most sceptical.

EXISTING REGULATIONS.

Replies to an inquiry addressed to each state as to the methods of disinfection employed in railroad cars engaged in interstate transportation, show that 11 call for the use of formaldehyde, 23 have no regulations at all, and five require the application of certain unspecified preparations. There is, however, no uniformity of procedure. In some cases, the regulations call for treatment of the cars at the end of each journey; in others, they receive attention at intervals of one to two months.

The preponderance of formaldehyde fumigation over all other forms of disinfection, as revealed in these figures, is greatly to be regretted from the fact that this method is wholly unreliable. As I have had occasion to point out recently, contrary to the generally accepted notion as to the use of formaldehyde for fumigating rooms, this disinfectant does not act in the form of a vapor or gas; in practice, it is dissolved in the minute droplets which result from the condensation of steam, in the absence of which formaldehyde has no bactericidal action whatever. Water will take up in solution 40 per cent. of formaldehyde gas, in which form it is known officially in the United States Pharmacopœia as "formaldehyde solution," the Rideal-Walker co-efficient of which is 0.3; i. e., it has about one-third the efficiency of pure carbolic acid. If we take one part of carbolic acid in 20 parts of water as our standard of efficiency, to prepare a solution of formaldehyde capable of doing the same work, one part must be mixed with six parts of water.

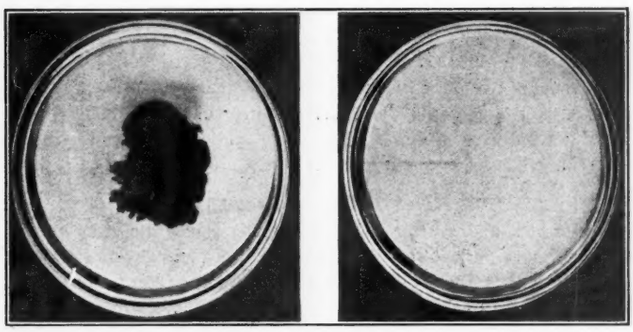


Fig. 1—Control Plate Showing Vigorous Culture. **Fig. 2—Treated Plate With Organisms Destroyed.**

We now see the difficulty of obtaining uniformly trustworthy results when working with formaldehyde. If too much steam is admitted into the chamber the ultimate dilution produced may be too weak; and if too little steam is admitted, part of the formaldehyde will be unavailable, i. e., it will remain in the gaseous form, which as already explained, has no bactericidal action.

Klein, the eminent European bacteriologist, in a report to the London County Council in 1902, said: "In cases where wood flooring, unpainted or unvarnished articles of furniture or similar absorbing materials and cloth fabrics are to be subjected to disinfection on account of their being possibly polluted with tubercular sputum, disinfection with formalin (40 per cent. formaldehyde) will not suffice."

In view of the fact that the destruction of the tubercle bacillus is one of the principal objects to be aimed at in the disinfection of railroad cars, the futility of using a preparation which on the highest authority has been demonstrated to be inefficient for this purpose must be manifest. Dr. Vaughan on the occasion referred to above said the method of disinfection by formaldehyde was "simple nonsense," and the medical writer in the *Public Ledger* characterizes formaldehyde fumigation as "a tedious, dangerous and unreliable method of performing this work."

The only satisfactory alternative to fumigation is the appli-

cation of a modern liquid bactericide of guaranteed efficiency. As regards the relative merits of the two processes, the *British Medical Journal* of November 3, 1894, referring to the disinfection of rooms by fumigation, stated: "On the ground even of economy there is no comparison between this obsolete process and a disinfectant spray; and while cases of renewed house infection are familiar to almost every medical officer in this country, we have Dr. Dujardin-Beaumetz's authority for saying that where the disinfectant spray has been introduced they are practically unknown in France."

The efficiency of the liquid spray method of disinfecting cars was demonstrated recently by practical experiments carried out before prominent officials of the New York Central & Hudson River, the Interborough Rapid Transit Company, the Erie and the Hudson & Manhattan. It was shown that the time occupied in treating the floor of a car by this method was only about 30 seconds, and that from a bacteriological point of view, the result was satisfactory, as will be seen by referring to the accompanying illustrations which represent the actual bacteriological plates employed in the experiments conducted before the officials of the Hudson & Manhattan Railroad Company.

The procedure adopted was to inoculate two sterile agar plates with a strong culture of B. prodigiosus (a bacillus much used by bacteriologists in experimental work by reason of its distinctive coloring), one of which was reserved as a control (i. e., it received no treatment), and the other placed on the floor, of which it became an integral part during the process of spraying—the glass cover of the plate, of course, being removed during this operation. Both plates were then incubated for 24 hours. The efficiency of the process is clearly shown in the accompanying illustrations, Fig. 1, the control plate, displaying a vigorous culture, while on Fig. 2, the plate treated, the organisms have been completely destroyed.

SELECTION OF BACTERICIDE.

As stated above, the most suitable preparation for use in railroad cars is one of the modern high-testing varieties. It should perhaps be explained here for the benefit of those who may not be familiar with the subject, that, briefly, the germicidal efficiency of a disinfectant is stated in terms of pure carbolic acid, which is taken as the standard. For instance, if we say a disinfectant has a co-efficient of 5, we mean that this preparation is five times stronger than pure carbolic acid and should be diluted for use accordingly. The standard dilution of pure carbolic, as adopted by hospitals, etc., is 1 in 25; therefore, using a disinfectant having a co-efficient of say, 5, the equivalent dilution would be 1 in 125. Working with a disinfectant having a co-efficient of 20—and preparations of this strength are available—it will be seen that the dilution equivalent to 1 in 25 pure carbolic acid is 1 in 500. The use of such a preparation will not only ensure efficient disinfection, but will entail a surprisingly low expenditure. Taking $1.50 per gallon as a fair average price in bulk for such a disinfectant, a simple calculation will show the cost of the working dilution of 1 in 500 to be well under one-third of a cent per gallon. Practical experience has shown that one gallon of such a dilution is sufficient for the disinfection of 600 square feet, from which it follows that 10,000 square feet can be disinfected at a cost of approximately 5 cents. A further advantage accruing from the adoption of the higher co-efficient is the complete absence of the objectionable odor which renders impossible the use of low dilutions, such as 1 in 125.

Railway companies are among the most enlightened of the public services, and although up to now the means which they have used for disinfection are utterly inefficient and capricious, the reason for this inefficiency is largely to be found in the fact that little but caprice has been available for their guidance.

Direct Railway from Rome to Naples.—The work on the direct railway now under construction between Rome and Naples, Italy, is being pushed forward rapidly.

MONTHLY CIRCULAR TO STATION AGENTS.

The Canadian Pacific, whose station agents are scattered over an immense territory, issues for their benefit a regular monthly bulletin, containing changes in connections and other things which, though perhaps not so important as new time tables, embrace nevertheless many details which enable the agent to better serve the public. Beginning with the present year this bulletin is enlarged and takes the shape of a handsome illustrated circular of eight pages; and its contents are made sufficiently attractive to induce the live agent to read it, even when the matter may seem not to affect his station. In line with the improvement in station service, now engaging the attention of superintendents in all parts of the country, this circular is to be warmly commended. A first step in broadening an agent who is too narrow is to get him interested in railroad matters outside his own field, and a circular like this is an appropriate means. The January circular contains 32 numbered paragraphs. A local agent could not do better than prepare himself to pass an examination on his knowledge of these 32 subjects. Some roads, to compile so much news in a single month, and make it interesting, would have to go outside their own territory; but that is not an objection to the idea. We note the information given in some of the Canadian Pacific items:

Paragraph 1 gives information of a change in train service on a branch, including a notice of a stage connection. Other paragraphs give information about through tickets, about conventions, about optional routing on certain tickets, and other subjects commonly found in circulars to agents.

Paragraph 3 tells of 66 miles of new double track just finished on certain divisions. No. 4 tells about new steamships being built for the company, with something about proposed excursions by these vessels. There is a picture of the "Empress of Russia." Paragraph 7 tells of the new city ticket office of the company in Montreal and there is a full-page illustration of the building, which belongs to the Dominion Express Company.

A paragraph of about 200 words describes the company's new yards at Transcona, six miles east of Winnipeg, which will occupy 550 acres of land and will have a capacity for 12,000 freight cars. A similar paragraph describes the new St. Lawrence river bridge at Montreal and the new station at Vancouver, which will cost $1,250,000. Other enterprises of the company mentioned are the enlargement of the hotel at Quebec; telephone train despatching, now extending throughout nearly the whole of the main line across the continent; new cars and engines ordered in the month of December, and new extensions of the service of the Dominion Express Company. At Fort William the company is building a bascule bridge to give access to its plant on Island No. 2; this will cost a million dollars.

A whole page is devoted to notes concerning the development of western Canada. At Calgary the Canadian Pacific telegraph office, in 1905, employed five persons; now the number employed is 150. At Medicine Hat a New York capitalist is building 100 dwelling houses. Carloads of machinery are arriving at this place every day, and the number of banks in the city is now eight. At Saskatoon a new concrete bridge over the South Saskatchewan river will be 1,462 ft. long, 61 ft. wide and cost $330,000. The Canadian Pacific hotel at Winnipeg will be extended at a cost of $1,500,000. Dropping from these grand enterprises to the every-day details of humdrum work, paragraph 32 calls the attention of agents to the instructions in regard to handling correspondence.

New German Railway.—A railway line of considerable strategic importance is to be built from Hanover to Cuxhaven, the German seaport at the mouth of the estuary of the Elbe river. The line, which will be about 120 miles long, will pass through Rottenburg, Bremervörde and Bederkesa. As the railway does not run along the coast, but midway between the Elbe and Weser rivers, trains will not be exposed to the fire of warships.

IMPRESSIONS OF HUNGARIAN RAILWAY PRACTICE.

Shop Emergency Hospital, Drinking Fountains, an Efficient Apprentice System, and the Labor Situation Are Noteworthy.

By Henry W. Jacobs.

At Budapest I had the pleasure of visiting one of the large shops of the Hungarian Railway in company with the general superintendent of motive power, Johann Papp. At this place, although the shops are not nearly as large as at Crewe, England, I found that, as a whole, the layout was more complete in detail than in the shops either in Europe or in the United States that it has been my pleasure to visit. Mr. Papp told me that the embodiments and refinements in shop and roundhouse layout which are applied in practice in Budapest were gathered by him, as a result of many journeys, from the best practice of each of the civilized railroad countries, including the United States and Canada.

EMERGENCY HOSPITAL.

For instance, on my first entering the office building assigned to the superintendent of shops, I was struck with the room, conveniently located at the entrance, for the reception of anyone who might be injured in the shops. This emergency hospital chamber was equipped with an operating table and the most modern surgical apparatus, so that major emergency operations could be conducted without a moment's delay.

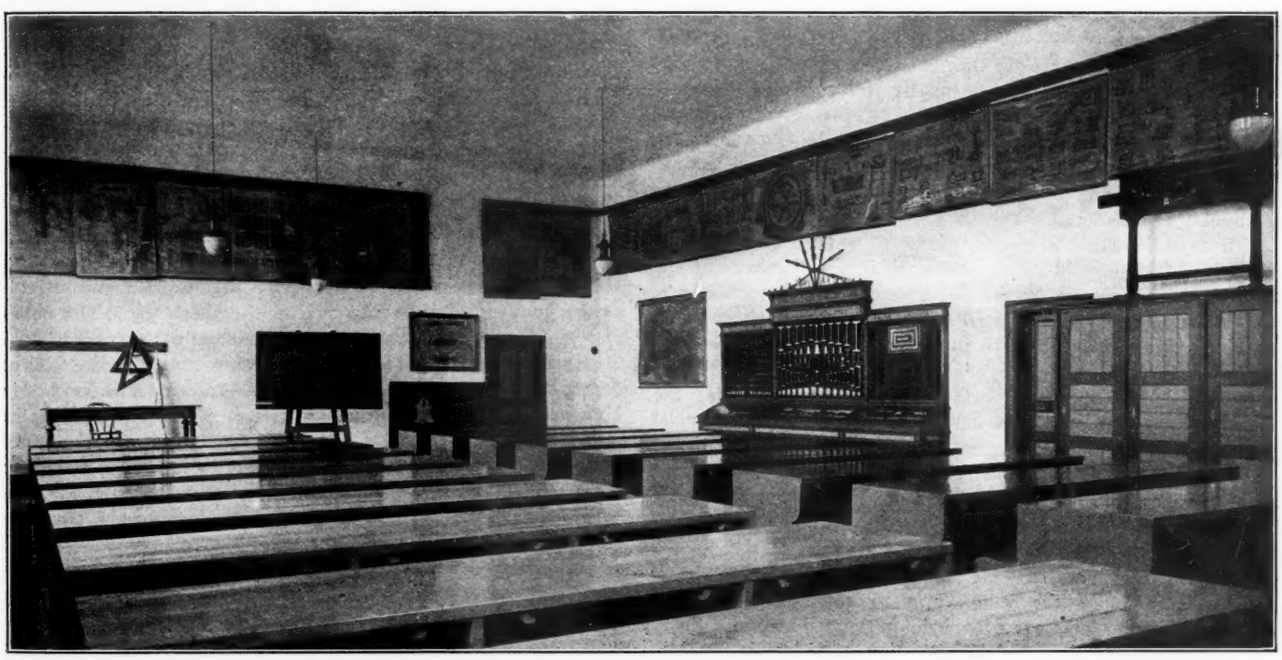
Not only are the shop employees so provided for, but men in the train service and passengers are similarly prepared for in case of any accident to trains, a full hospital train with road cars being held in readiness for departure to the scene of any accident upon telegraphic notice. The special equipment of these trains, allowing for the difference in purpose, is similar to that of our emergency cars for mining disasters. The cars constituting these trains are not old converted coaches, ill adapted to the purpose in view, but are complete with every regard for the comfort and succor of the injured.

DRINKING FOUNTAINS.

Another indication of the attitude of the administration toward the welfare of the men was in the machine shop. I observed a construction somewhat like a soda water fountain with a neatly dressed girl in attendance. This naturally surprised me very much, and I inquired as to what it meant. It developed that in order to offset the desire for alcoholic drinks, the superintendent of shops, Mr. Hermann, had decided to establish these soda fountains in the shops, where various kinds of soft drinks could be obtained by the workmen practically at cost, the men being free to come and go for such refreshing beverages just as they would in our shops for ice water. Any small profit that might remain over from the sale of the drinks was applied to a charity. Undoubtedly this institution is a most excellent step in the interest of the sobriety and health of the employees, and the superintendent of shops, or chief of shops, as he is called, is to be congratulated for this practical, humanitarian step.

APPRENTICE SYSTEM.

The next point that impressed me was the apprenticeship school or shop. Here in a separate building from the main plant the apprentice spends the first two years of his service under the direct supervision of instructors. Tools are made, such as chisels, flatters, taps, and many small parts of locomotives, in addition to many models of either special machine or locomotive types. During my visit they had under construction, to be used as a permanent exhibit, a complete model of one of the beautiful railroad bridges that have just been completed, spanning the Danube. This work was done by the apprentices under the careful supervision of practical mechanics. What particularly impressed me was the explanation given by Mr. Papp as to the method and purpose underlying the instruction period of the apprentices. Instead of the boys and young men passing from one department of a shop to another in a rather indiscriminate manner, picking up knowledge of work, perhaps sometimes indifferently from a foreman or the mechanics, or sometimes shop instructors, they were set apart during the first two impressionable years of their apprenticeship to be thoroughly



Apprentice Class Room of the Hungarian State Railways at Budapest.

grounded by those who were known to be most competent to instruct in skilled practical work, as to the right and best ways of doing each class of work so that bad or faulty habits of work would not be learned—to be unlearned later. For the succeeding two years the boys work in the regular shops where they receive additional care and instruction and gradually become amalgamated with the regular working organization. After the preliminary two years the boys are much better fitted to go into the main shops with the older mechanics and continue their apprenticeship.

During apprenticeship the boys have to attend school for two hours of each day, and for these study, lecture and drawing periods they are paid as they would be for productive work, the railway administration knowing that the cost of this instruction is a most valuable asset in the working ability of its future mechanics. The schedule of study hours during the four years' apprenticeship is as follows:

	Hours per week for each of the four school years.			
	1st year.	2nd year.	3rd year.	4th year.
Reading and general instruction	1	1	1	..
Review instruction in reading and writing	1	..	..	..
Composition	1	1	1	..
Arithmetic and geometry	2	2	1	..
Review instruction in mathematics	1	..	..	..
Time keeping and cost accounting	..	..	1	..
Physics and chemistry	2	1	..	..
Elements of mechanical design	..	..	1	1
Instruction in theory of machine power operation	..	1	1	1
Instruction in hygiene	..	..	..	1
Mechanical drawing	4	4	4	4

In selecting apprentices the first chance is given to those sons of railway employees who have capacity for this class of work. Candidates for membership must have passed through the middle grades of the common school, and be over fourteen years of age. Every year a theoretical and practical examination is held. In addition to giving oral and written answers to examination questions, the boys are permitted four hours in which to accomplish a certain piece of work according to a blueprint. The way in which this work is done, as well as the mental aptitude shown by the pupil, determines his proficiency. The examinations are conducted in the presence of parents and others of the public that are interested. Prizes are awarded for those that are especially advanced.

Before completing his fourth year of apprenticeship, the apprentice must produce a masterpiece of work, usually a model of some machine, locomotive or structure used in the railroad service. During the apprenticeship course the boys are paid regular wages, which are increased from term to term, ten per cent. of their earnings being held out in a savings fund until the end of the apprenticeship.

Upon the completion of their apprenticeship there is no binding agreement upon the young men to continue in railroad service, although places are provided for those that desire them. The Government Railroad Administration considers it its duty to the industries of the nation to offer this sacrifice upon the altar of education and advancement of the commercial development of the people.

I regretted that in this visit there were not present such missionaries as George M. Basford, who for many years has been an advance prophet of railroad apprenticeship instruction in the states, and also those men who have followed up his inspiration by practical application on some of our largest railway systems, such as Mr. Thomas, Mr. Cross, Mr. Henshaw, and others, whose ideal has been to make thinking, skilled mechanics of the younger generation, rather than specialized automatons. In Budapest was wrought into complete execution the kind of instruction that these American pioneers are so earnestly developing on the roads that they serve, and too much credit cannot be accorded to the earnestness of their work and the support that is being given by their officers.

WHAT BECOMES OF THE APPRENTICE?

What becomes of these apprentices after they have completed their general grounding as all-round mechanics? It is only after this general training that the special development of the particular abilities that the young man may have shown is undertaken. In no American shop have I seen specialized pursuits and occupations carried to the extent and thoroughness that exists in the shops at Budapest. In each class of work, such as erecting, rod, bench, piston rod and crank pin work, machine work, etc., each of the gangs was composed of carefully trained men who were especially fitted for the particular class of work to be performed by it. It was explained that certain qualities in mechanics, as in poets, are inherent and cannot be acquired by training. How often do we see men operating fast moving machinery requiring quick action and co-ordination of the eyes, the brain, and the hands, who may have quick action between the eyes and the brain, but do not have co-ordination of the hands, so essential to most efficient operation. These men would be much better adapted to their occupation if they were working on the erecting floor or at the bench. Again how often do we find men of a nervous and energetic temperament fretting away their time standing at machines when they should be working in the erecting shop where vent could be given to their energetic natures. And again we find men running lathes where great accuracy of touch is required, such as in making close fits, who are by temperament and physical make-up ponderous and clumsy, and who would be happier working in a steam pipe gang lifting and fitting up heavy steam pipes. The contrast and misfit of occupation is as glaring as the performance of a draft horse would be on a race track.

The two years of training in a separate building gives those who are studying the character and capabilities of the apprentices an opportunity to later select and assign them to that class of work which is especially fitted to their qualities and characteristics. A man does that thing best which he loves to do—because he can do it well rather than because he is directed to do the work without consideration for or sympathy with his particular aptitudes.

TRADES ORGANIZATIONS.

Of special interest is, of course, the organization and attitude of the body of the working men in the shops, etc. The policy of the Hungarian State Railways is that of the open shop. Trade unions in the form that we know them in the United States are non-existent on the government railroads. In Hungary many recruits from all classes of trades (outside the railways) are drawn to a political party known as the social democratic party, whose members are principally socialistic. This political party has a vigorous representative in the parliament, and its program is one of spirited protest against the constituted form of government. For this reason it is deemed against the interests of, and loyalty to, the state to permit those who serve the state to be affiliated with a political organization in conflict with the administration of the state enterprises. No man in the state railroad employ may be a member of the social democratic organization, upon pain of dismissal.

ADJUSTMENT OF GRIEVANCES.

On the other hand, excellent arrangements are made for the presentation or discussion of grievances or desired changes in the working conditions of the men. The men have regularly elected representatives from among their own members, for each division of the railway, and for the railway as a whole. These representatives sit in session with officials selected by the railway for the mutual discussion and adjustment of matters affecting the welfare of the men. In practice this permanently constituted arbitration board seems to work out very satisfactorily, for both in working conditions and in rates of pay the railroad men, and particularly the shop men, are better off than those in similar kinds of work in private employ elsewhere in the country.

The railway administration has no difficulty in attracting to its service the most competent men in each of the trades, it being considered an honor to be in the government employ. When a man has served a probation period of three years, he then becomes a sworn worker for the state, and cannot be

summarily dismissed. If there were just cause for dismissal or other corrective measure, this cause is determined as a result of evidence presented before a regularly constituted court, or committee of inquiry, and upon its recommendation a responsible officer will take action. In this way the men are guarded against injustice due to action that is hasty, ill considered, tyrannical or born of personal feeling or prejudice on the part of some minor official or foreman. In the manifest love that the men have for their work it is seen that this security in their positions, so long as they do their duty, does not make them slothful or negligent.

In spite of the fact that there is always a superabundance of competent men in the various trades anxious to get into the railway service, the railway administration deems it to be to the interest of its employees and their families, that opportunities should be afforded their sons to specially fit themselves for railroad positions, if they are capable of so doing.

Because of this general method of training, the men not only turn out careful work of high quality, but the occupations being specialized favor large production of similar units or pieces at a minimum price per piece. A further factor in bringing the standard unit cost to a remarkably low figure is the system of paying the men upon an output basis instead of an hourly wage. These two policies, careful training and intensive wage system, coupled with careful engine house inspection by the enginemen themselves, make for the best and cheapest locomotive operation; and when replacements or repairs are necessary, these operations are performed at the minimum cost. For these reasons, the costs of locomotive maintenance are found to be extraordinarily low on the Hungarian lines, upon any unit basis selected for comparison, as compared with American or with other European lines.

RECORDS OF AUTOMATIC BLOCK SIGNALS.

Automatic block signals are now an important element in the safety of travel on most of our principal railways, and they are so conspicuous a feature that even the unthinking public takes cognizance of them. The advertising department makes use of them, and to good effect. One transcontinental line, in advertising a recent excursion, emphasized the statement that "every inch" of the line to be traversed was protected by automatics.

And, though the perfection to which automatic signaling has been brought on American railroads makes a highly creditable chapter in recent railroad history, this creditable record gets very little notice in print. We have an almost unbroken record of negative evidence, for reports of collisions due to faults in automatic signals are exceedingly rare; but this negative evidence is about all. The reader, therefore, will be interested in the following records of the performance of automatics on eight prominent roads for one year. We are not permitted to name the roads, but the facts have value regardless of names. Moreover, we have to show the reverse, not the obverse of the picture. The magnitude of the signals' virtues is shown by setting forth the exceedingly small proportions of their faults.

As is well known to railway men, the signal records of different railways are kept according to methods which in details are quite varied, so that exact comparisons cannot be made except by means of elaborate studies not now practicable. Nevertheless, these ratios are in some degree instructive. And the figures are suggestive by way of showing the paucity of information available and the need of standards.

AUTOMATIC BLOCK SIGNAL PERFORMANCE ON 8 RAILROADS.

Road.	Ratio of Failures to Operations; 1 in	Ratio of Dangerous Failures to Operations; 1 in
E[1]	.....	.....
G[2]	58,736	2,246,663
H	125,222	3,072,983
L	26,783	1,127,566
N	35,308	.....
O	27,027	1,290,535
R	21,878	2,428,180
W	.....	600,464
Y	.....	1,606,231

[1] See below.
[2] One month.

All causes of false clear automatic signals reported on road E for 12 months were as follows:

a, Water leaked into case; froze slot-arm in clear position.
b, Someone broke into banjo head (inclosed disk signal) and bent counterbalance rod so it fouled head, holding signal clear.
c, Reported clear with train in block; maintainer found nothing wrong.
d, Grounded slot coil.
e, Distant arm reported clear with train in block. No cause found.
f, Home disk bent and fouled side of head.
g, Distant arm partly clear with home arm at stop; sleet and snow on blade.
h, Home arm going to stop position caught on lamp; pole changer did not operate and home and distant in rear cleared together.
i, Reported. No cause found.
j, Water in relay contact held local circuit closed.
k, Lightning.
l, Carbon point of relay fused by lightning.
m, Corroded and grounded joint in battery wire.
n, Open joint in wire under planking at drawbridge.
o, Grounded control circuit.
p, Temporary home and distant line wires crossed; insulation mischievously or maliciously cut.
q, Broken mechanism.
r, Tie plates under insulated joint bridged the insulation; current came from rear battery and closed relay.
s, Broken stop link.
t, Foreign current.
u, Polarized armature stuck.
v, Western Union guy wire touched line.
w, Someone broke open relay box and bent relay fingers; relay remained closed.

In this list it will be seen that carelessness or inefficiency of the men in charge was responsible for items *m, r, u, v,* and probably *o;* cold weather for *a* and probably for *j* (freezing of condensed moisture); snow for item *g;* lightning for *k, l,* and probably *d;* malice or mischief, *b p,* and *w;* and defects of apparatus *f, h. n, q,* and *s.*

Road H is one with a dense passenger traffic within a small territory. Road N reports that the record is "admittedly poor," new signals having been installed before there had been time to instruct maintainers properly in their duties.

The causes of all false clear automatic signals reported on Road O for 12 months were as follows:

a, Defective signal magnet.
b, Ice in signal cylinder.
c, Ice on contacts of switch circuit controller—failed to shunt track.
d, Pin in connecting rod leading from switch to switch box either worked out or was removed by person unknown; failed to shunt track.
e, Switch circuit controller disconnected; failed to shunt track.
f, Broken wire leading from rail to switch box; failed to shunt.
g, Springs weak in combined circuit breaker and plunger lock; failed to shunt.
h, Improper wire connections to signal.
i, Linemen changing wires got control wire crossed with another wire.
j, Pivot screw on polarized armature of relay becoming loose and binding armature it could not move.
k, Bracket in relay tightened causing same conditions as last preceding.
l, Magnet burned out by lightning and relay armature fused closed.
m, Relay badly damaged by lightning, not allowing armature to drop away.
n, Caution (light). Relay sticking clear.
o, Contact points in relay stuck to contact post.
p, Rods supporting relay contact binding failed to open when de-energized.
q, Fixed red marker light displayed white by reason of lens falling out. Broken set screw.
r, Lamp hung on bracket improperly. Showed white light.
s, Broken insulation on pole changer. (Two cases.)
t, Operating rod on pole changer broken.
u, Broken rail or broken bond wires and foreign current. (Five cases.)
v, Disk signal. Moisture between armature and magnet on buffer holding disk clear.
w, Disk signal. Bearings slightly worn.
x, Unknown. (Two.)

30 Total.

In this list, four items, *c, d, e, f,* have to do with connections at outlying switches. These appear to have occurred in sections where the signal control (wire line) circuit was not run to the switch and where, consequently, a track connection, arranged on the "open circuit" principle, was depended upon to set the signal in the stop position when the switch was opened. Ten

of the failures here listed, *b*, *g*, *h*, *i*, *j*, *k*, *n*, *o*, *p*, and *r*, are chargeable to negligence; but it is to be observed that in at least four of the cases, *b*, *g*, *j*, and *k*, the trouble was of a character which could have been prevented only by the highest degree of vigilance; in other words, we have here a reminder that the requirements of the signal maintainer's duties are severe.

On Road Y the causes of all false clear automatic signals reported for one year were as follows:

December—1, from relay sweating and freezing.

January—1, due to control wire cut and short circuited. (Maliciousness.)

February—1, carefully investigated but no cause discovered.

March—1, due to relay sweating.

April—1, due to piece of baling wire thrown over line wires; 1, due to control wire touching lightning arrester wire, thereby grounding circuit. (Fault of maintainer.)

June—3, due to lightning damaging relays; 1, due to piece of barbed wire thrown across line wires; 3, due to ants getting into arc lamp lightning arresters and thereby grounding circuits; 1, due to circuit controller sweating; 1, due to bent vertical rod rubbing against inside of post; 1, cause unknown.

July—1, due to relay contacts fused by lightning.

August—3, due to lightning damaging relays.

October—1, due to slot arm of signal mechanism being improperly adjusted (fault of maintainer); 2, failures the cause of which is uncertain but supposedly due to excessive mechanical friction in toggles of slot arm (the toggle angles are to be changed).

November—1, carefully investigated but no cause found.

Road Y adds the following comments: "We investigate all false clear failures very carefully and take such action as is necessary to prevent their recurrence whenever it is possible to do so. We have succeeded in getting an oil that will not freeze at our lowest temperatures and have no further trouble from dash-pots freezing, which used to cause some failures. Last year we increased the toggle angle on certain signal motor mechanisms from 5/16 in. to ⅜ in. on three divisions and since this change we have had no unexplainable false clear failures on these three divisions. We therefore believe that practically all of our false clear failures, which used to be reported as 'cause unknown,' are really due to friction in the slot arm and can be prevented by this change. By substituting bone bushing for Lavite bushings in our relays we have reduced the number of false clear failures due to relays being damaged by lightning, but have not been able to entirely overcome them. We have so far been unable to find any lightning arrester that will protect our relays and other signal apparatus and all lightning arresters that we have tried so far have shown a liability to ground our circuits from time to time. Failures are occasionally caused by relays sweating and then either freezing or rusting, but we have found no cause for this and no remedy up to date. Although there are two failures in the above list caused by pieces of wire being thrown over our line wires (which are bare) we really have very few false clear failures from this cause and do not feel justified in using insulated line wires, which would cause other trouble. To prevent failures from up-and-down rod rubbing, we are taking the guides out of all our signals as we have decided that they do more harm than good."

As we have said, the really significant thing about these records is what they tell by indirection. The writer who will put on paper an equally illuminating story of the maintenance which has produced the 999,999 safe movements (to one that is unsafe), has not yet arisen. As further illuminating the problem which confronts the signal engineer in his efforts to achieve perfection there is given below the record, for three months, on a prominent road, of the discipline administered in cases where employees were chargeable with misconduct or negligence. In each of these cases all of the employees of the department were made acquainted with the facts as here given, with the names omitted.

DISCIPLINE: SIGNAL DEPARTMENT.

November 3.—Slot at interlocking plant slipping. Investigation revealed that batteryman was careless; battery dirty. Batteryman suspended two days.

November 8.—Signal failed on account of exhausted battery element. Maintainer and batteryman inspected battery less than one week previous. Maintainer and batteryman suspended one day each.

November 17.—Batteryman discharged for being off duty without permission.

November 19.—Batteryman discharged for drinking and neglect of duty.

December 1.—Slot control springs in electric lock changed by maintainer to remain permanently closed. Maintainer suspended ten days.

December 2.—Signal lamps found in dirty condition and otherwise neglected. Lampman suspended two days.

December 16.—Batteryman transferred to construction gang on account of inability to be neat. His previous good record earned this consideration.

December 31.—Signal failed and delayed several trains on account of maintainer being absent without permission. Maintainer discharged.

January 6.—Careless maintenance and inspection of lamps. Lampman discharged.

January 15.—Improper inspections of signal batteries and lamps. Maintainer and batteryman discharged.

January 31.—Mechanical repairman intoxicated. Discharged.

WHAT MANY STATION AGENTS MISS.

BY A STATION AGENT.

With the increasing tendency of the state and interstate commissions to regulate and lower rates, and the insistent demands of the employees for higher wages, there is left but one source of increased profit for the American railroads, and that is to get more business.

The agent at important competing points is naturally expected to be on the lookout, and to get all of the business that can possibly be secured; this is all well and good, but the agent at the smaller point may do something; he has not been properly impressed with the necessity of working up business. It has usually been understood that as there was no competition all business was sure to be given to him.

The successful farmer is the one who makes two blades of grass grow where only one grew before; and the successful agent is one who gets two tons of freight where only one was secured before, whether his station has competition or not.

Many agents are working day in and day out over gold mines of possible revenue; but being blind they see not, and being deaf they hear not. The community around may be capable of producing an unlimited amount of some commodity, which would furnish a neat revenue if a market was secured for it, and at the same time make the people more prosperous. It may be grain, timber, potatoes, tobacco, live stock, or any of the numerous things that go to furnish the revenue of a railroad. The thing necessary is to get the local people interested, get them to work together. Get them willing and eager to handle the producing end of the matter, and then as a rule the finding of a market is easy. Enthusiasm is most contagious, and once let a live agent go into the matter in earnest, and he will be surprised at the support given him and at the results obtained.

For instance, the town of A issued bonds and built a dam across the river to secure waterpower for generating electricity, to be sold at cost to residents, and for use of incoming industries. The town authorities, men who were elected, not on account of their fitness for the position, nor on account of their business ability, but because they were good fellows, have been vainly trying to get some company to come in and use this power free, but thus far a thousand horse power or more remains idle. It is a source of possible revenue for the railroad company, and it seems to me that the agent there should interest himself in trying to assist the townspeople; but he takes the stand that it is the duty of the traffic department to look after such matters. The traffic man in charge of that district, who is a good man and is doing his best, has so much territory to cover that he cannot give this matter the attention it deserves. It is a source of possible revenue, and the company is losing that revenue.

This agent has leisure time and the company is paying him for all of his time; why cannot he use this time, that belongs to his employers, in assisting the town officers in getting some industry to come in?

Station B is situated in an agricultural district. The people by popular subscription built a factory to can vegetables raised

by the farmers. The farmers fairly swamped it with tomatoes, corn, pumpkins, and everything that it could handle, but through ignorance of selling methods, and inefficient management it was a losing venture. After the second year it shut down. A few feeble efforts were made to sell the property, but what was everybody's business was nobody's business, and the machinery lay and rusted several years, and was eventually sold for junk. Here was another possible source of revenue. The owners of that property would have practically given the plant to someone that would guarantee to operate it, and it would seem that the agent, with the assistance of his traffic or industrial department, could have found some canning company that would take it.

Agent Jones was in charge of station C for eight or ten years. He handled the position as others before him had handled it, taking in what money came his way. If business was good it was all well and good; if it wasn't, why, he was not paid for worrying! Agent Brown took his place. Brown made it a point to get acquainted with his patrons; he learned what crops they raised most successfully. Through the agricultural college maintained by his state he secured much information about the crops they were producing. He worked up sufficient interest among the farmers to get them to invite representatives from the agricultural college to address them. He circulated a paper among them in which they pledged themselves to plant a certain acreage in potatoes the following season, provided a warehouse was built, and secured pledges for about 600 acres.

Armed with this he went after the larger and more important wholesale potato companies, with the result that two warehouses were at once put up. In former seasons the farmers had a market for their crops only as buyers happened in; now they have a steady market and can sell any day. In former years the total of the land planted in potatoes would not exceed 100 acres; this last season over 500 acres were dug. When one figures that about four acres will produce a carload of potatoes, which will average $50 freight charges, it will be seen that not only the farmers made money, but that the railroad came in for its share.

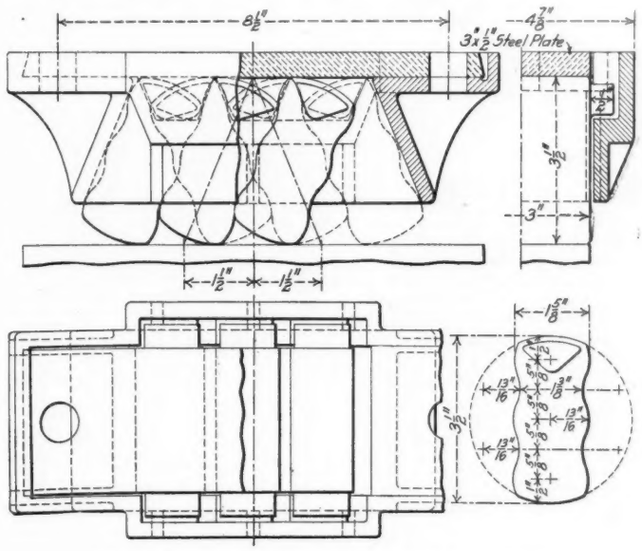
In a matter of this kind the agent at the noncompeting point has an advantage, in that he gets all of the business he helps develop. If it is a competing point his competitor is sure to share in the results of his labors. The agent at the country station has an advantage over the agent in the city, in that the city agent must work up such matters to hold his position, while the man at the small town is overlooked; and when he does start something, it is noticed.

There are two ways of getting a good position; one, by being appointed to one; another, by developing the one you have into a good one. To my notion there is much more satisfaction holding one of the latter than the former.

RAILWAY DEVELOPMENT IN BOLIVIA.—The ambitious program of railway construction in Bolivia which was put forward as long ago as 1904 has only been fulfilled in part. The cost of construction per mile is exceptionally heavy in that country even for South America. Nevertheless there are open to traffic today in Bolivia some 700 miles of native line, exclusive of the track of the same systems which is located in neighboring territory. Recently a preliminary survey was made of the entire line of the Chimore railway, the work having been divided into sections, the first of which is from Salta to Santa Rosa; the second from Santa Rosa to Santo Domingo; the third from Santo Domingo to Puerta Patino; and the fourth from Puerta Patino to Secuano. The fifth will reach the headquarters at Trinidad. Plans for a branch railway from Macha-cama-ca to Uncia have been completed and passed by the government. It has also accepted the proposal of a French syndicate for the construction of a line between Quiaca and Tarija. This line will supply an important link in the railway system of the republic, and will place Bolivia in direct communication with Argentina.

ANTI-FRICTION SIDE BEARING.

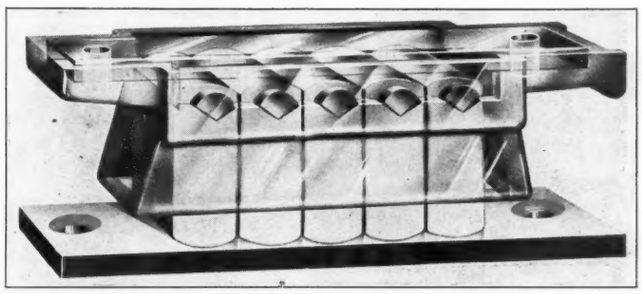
An interesting development in side bearings for car and tender trucks has been made by Edwin S. Woods & Company, Chicago. These bearings are intended to carry heavy loads with a short travel. The illustrations show two applications; the one with the flat sides is used for tender trucks, and the one with the corrugated sides for freight car trucks. The rollers work between oil-tempered steel spring bars, and are made of malleable iron or cast steel. The design is based on the fact that the capacity of rollers varies directly as their diameter and length. That is to say, a roller one inch in diameter and 2 in. in length, or 2 in. in diameter and one



Three-Roller Side Bearing for Freight Cars.

inch in length, will have twice the capacity of a roller one inch in diameter and one inch in length. In the case of the tender roller bearing, there are five rollers 4 in. in diameter and 3 in. long, which is the equivalent of one large roller 10 in. in diameter and 6 in. long. These rollers have a side clearance of ⅛ in., and the friction is restricted to the rolling on the two bearing plates.

The drawing shows a three roller bearing for freight cars. These rollers are corrugated, which allows them to be in contact in all positions and still have a greater length of travel than



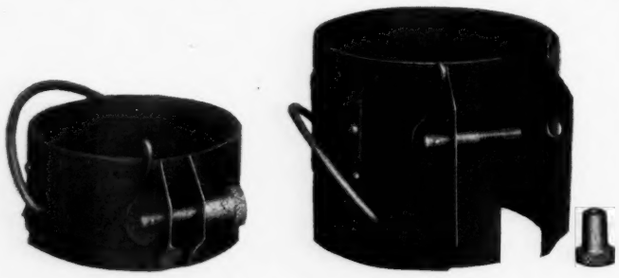
Anti-Friction Side Bearing for Tenders.

in the case of the flat-sided roller. In the normal position the corrugations will be in contact at their apices. As the rollers move to one side or the other the apex of one corrugation will slide into the hollow of the other until there is a positive bearing, as shown in the illustration. Of course, it is necessary that these corrugations be carefully made to the correct radius, which is one-half the width of the roller. In the present instance the travel is 1½ in. each side of the center line, making a total of 3 in., which is probably more than will

be required in this class of service, although by slight changes in the design of the roller this movement can be increased. The claims of the makers of this device are that it is of simple construction, contains no small parts, requires little attention, and has a large carrying capacity.

GRAPHO-METAL PACKING.

A difficult problem in the maintenance of locomotives is that of keeping the rod and valve packing in a good, non-leakable condition with the least amount of wear. To provide for this a new packing was recently placed on the market by the American Piston Company, Indianapolis, Ind. It is known as the Grapho-Metal packing and, as its name implies, is a combination of a special soft babbitt metal and graphite. It is made up of half rings, as shown in the illustrations, and is



Nut Lock and Piston Rod Shields for Westinghouse Cross Compound Pump.

especially adapted to air pumps, valve stems, throttle rods, cab valves, injectors, etc. It is easily compressed by screwing the gland nut down hard after it has been applied, which forces it against the rod, adapting it to the position or shape of the rod, and in this way allowing for any imperfections in alinement. The end surfaces of the upper and lower rings contain a lower percentage of graphite, thus forming a support for the packing in cases where the stuffing box clearance is too great; also sealing the packing into the stuffing box, and in this way restricting the loss to service wear only. This is

Air Pump Packing.

Throttle Rod Packing.

found to be slight, owing to the lubricating qualities of the graphite which is always in contact with the rods.

The air pump packing is divided into rings and is applied in the ordinary manner, care being taken to see that the gland nuts are firmly screwed into place. The special advantage of the packing in this service is that no swabs or oil cups are required, as the graphite will give the necessary lubrication. After the pump has been in operation a short time the packing will become polished, which will reduce the friction and wear. Reports from roads using this packing state that it has been in service during the last 18 or 20 months and is still in good condition. The pumps may be taken out of service and repaired without necessarily destroying the packing, as the lye or acid baths usually given the pumps at such times have no effect on it.

The throttle packing is made up of a number of rings, depending upon the depth of the stuffing box, and is applied in the same manner as on the pump, being screwed hard up into place so that there will be a positive bearing on the rod. The packing for cab fittings is made in one piece. This packing has also been used successfully on injector steam rams and water valve stems, and is being developed for use on steam pistons for superheater as well as for saturated engines. It has also been successfully used on a needle valve of a Diesel crude oil engine during the past year, resisting a pressure of 1,200 lbs. per square inch.

A combination piston rod shield and nut lock has been devised by the same company for use on air pumps, which together with the air pump packing described, comprise the air pump packing set. The illustrations show the shields for a Westinghouse cross compound pump. The large shield is shown open ready to be placed around the rod. It is closed and held in position by the bolt and nut shown. The inner sleeve is then raised by pressing down on the adjusting lever until it bears firmly on the upper and lower gland nut. The cam on the head of the bolt is then thrown over, firmly clamping the shield to the gland nuts. The necessary adjustments for making the locking lever effective are made with the knurled nut on the clamping bolt.

UNION PACIFIC ACCIDENT CHART.

The Union Pacific has posted in its various agency offices a large "accident chart" showing the remarkable improvement in its accident record in the last nine years, as the result of its campaign for safety in operation. The chart looks like a condensed profile of a road across the Rocky mountains, except that it shows only one slope, the peak being almost at the beginning of the record in 1903. The chart is ruled vertically for months and years from July, 1903, to June, 1912, and horizontally for train accidents per 1,000,000 locomotive miles, and the resultant curve shows the fluctuations in the accident record by seasons, with an almost constant reduction from year to year. Beginning at a point showing 19 train accidents per 1,000,000 locomotive miles in July, 1903, the highest point reached is for December of that year, when the line shows 27 accidents per 1,000,000 locomotive miles. In the fiscal year 1904-1905, the highest point shown is 25 accidents; in 1905-1906, 22; 1906-1907, 17; 1907-1908, 16; 1908-1909, a fraction over 16; 1909-1910, 13½; 1910-1911, 8; 1911-1912, 6. The highest and lowest points on the chart are for December, 1903, with 27 accidents, and February, 1912, with a fraction under 3. Below the chart is printed the following:

"The black irregular line shows the reduction in accidents as a result of the heavy investments made by this company in automatic electric block signals, good equipment, first-class roadway and double track, aided by good men and good discipline.

"This chart does not include injuries or deaths, but illustrates the causes that contribute to same, although of accidents classified below, the large majority do not cause deaths or injuries.

"Collisions.

"Derailments from defects of road and equipment, negligence in operating and unforeseen obstructions.

"Other train accidents.

"The Union Pacific holds courts of inquiry to determine the cause and responsibility in each case, and gives to the public information promptly of all its accidents when accompanied by fatalities or injuries."

Maintenance of Way Section.

THE March Maintenance of Way Edition, if published the third Friday of the month, as is our usual custom, would be issued on March 21. The American Railway Engineering Association will meet in Chicago on March 18-20, and a *Daily Railway Age Gazette* will be issued on the morning of March 21. It has, therefore, been decided to publish the Maintenance of Way Edition one week earlier than usual, or on March 14.

THE recent renewal of active hostilities in Mexico will be watched with concern by those southwestern roads which depend on Mexico as the main source of their track laborers. This latest outbreak, combined with the war in southeastern Europe, will undoubtedly intensify the labor shortage during the coming season.

IF marks are made upon the rails at the ends of sections of track which are now heaving badly, they will be of considerable assistance next summer when the season's track work is under way. By improving the drainage at a few of these worst places each year, the standards of maintenance on the entire section can be greatly raised in a few years at a comparatively moderate expense.

AT this season of the year the handling of locomotive cinders is frequently a vexatious problem. It is necessary that they be removed from the pits promptly, and when wet down before loading they are very likely to freeze in the cars so that in some cases it is necessary to use light charges of dynamite to break the frost before unloading. At most terminals the disposal of these cinders during the winter is far from satisfactory.

THE mildness of the winter thus far is in marked contrast to the conditions existing a year ago, except in the north Pacific coast states, where the winter has been more than usually severe and the snow fall above normal. However, even in the central states, although comparatively free from snow, the temperature has been low enough during recent weeks to cause considerable difficulty in keeping all facilities in use. For this reason, the next contest, that on "Winter Methods," is timely. In this contest, descriptions of methods new or not generally used for overcoming any of the many difficulties encountered in the prosecution of construction or repair work, or in the routine maintenance work of keeping the tracks, water stations and other facilities in service, will be eligible. Prizes of $25 and $15 will be paid for the first and second best papers received, while all others accepted and published will be paid for at our space rates. All contributions should be sent to the Civil Engineering Editor, *Railway Age Gazette,* Transportation building, Chicago, and must be received before February 25.

ONE of the best evidences of the increasing appreciation of the value of the annual exhibit of the National Railway Appliances Association, which will be held in Chicago from March 15 to 21, inclusive, is the comment heard after the close of each exhibit that more supervisors and foremen attended than in any previous year. The attendance of these men reflects the more general support given this exhibit by the railway officers, many of whom not only arrange for their men to get away, but advise their supervisors and more progressive foremen to attend. One roadmaster, located over 450 miles from Chicago, had his foremen select two of their number to attend the exhibit last year. These men were at the Coliseum an hour before the doors opened and spent the entire day studying the various devices. Upon their return they wrote a report which was discussed at the next meeting of the foremen. Several roads in the vicinity of Chicago sent all their foremen from certain divisions last year, while others at a distance arranged for their roadmasters to attend. The value of the opportunity to see not only the more recent developments in maintenance of way material, but also standard appliances used on other roads, is evident. The roadmasters and foremen are among the most careful students of the various devices, and many exhibitors vouch for the practical criticisms made by them.

WITH the shortage of labor which is certain to develop during the coming season, and which will be more serious than that of 1912 if present indications of the amount of work to be undertaken are accurate, it is highly essential that those in charge of maintenance of way work make every effort to start as early in the spring as possible. Those roads which started early last year not only got practically all the men they required, but were enabled to select their forces to a large extent and secure them at a rate considerably lower than that paid later in the season. When wages advanced about the middle of the summer they were able in some instances to let many of their men go without serious detriment to their work, while other roads which started late in the season were unable to secure the number of men required, and in a number of instances were forced to postpone needed improvements entirely. Furthermore, work done in the spring is better done, for the weather conditions are more favorable and the men are more willing to work after a winter spent in inactivity. To take full advantage of these conditions, plans must be made now and material secured and distributed in advance of the work. Ties can be stacked along the right of way ready for insertion; rail can be distributed and switch and other material can be assembled so as to guard against needless delays. Enough tools for the work in view can be gathered together, bunk cars can be cleaned and fitted up for the men and many other preparations made which will lessen the amount of work necessary when the season actually opens. Not only is it economical to start early, but from the outlook it will be positively necessary to do so this year if the work outlined is to be completed.

THE seasoning of ties and other timber before treatment has been the cause of much discussion for years. Equal attention has not been given to the benefits resulting from seasoning ties after treatment. Owing to the very rapid increase in the use of treated ties, the demand for them has been such that they have been given little opportunity to season after leaving the retorts, but have been immediately shipped out to be put in track, especially late in the fall. Because of the increased expense and difficulty of operating a plant in the winter, many plants whose capacity is such that they can treat the required amount of timber during the summer season close down during cold weather soon after they have completed treating that season's requirements. As a result ties are required the following spring almost as soon as the plant begins operation and are put into the track as fast as they can be taken from the cylinders. The detrimental effects of this practice have been observed with ties treated with zinc chloride more than with those treated with creosote. The rapid corrosion of track fastenings, especially spikes in zinc chloride treated ties, has been noted in some instances and has been generally attributed to lack of seasoning of the ties. The rapid drop in potential of track circuits for signals and crossing bells which has been observed where such ties have been used has also been attributed to the same cause. The detrimental effects of a too quick insertion of creosoted ties are, however, of a different nature and are reflected in the tie itself. Not only are ties which have thoroughly dried out after treatment much less disagreeable to handle, but they are more solid throughout, as would be expected to be the case

after the oils which tend to soften the fibres have evaporated. This also tends to give greater strength to the timber itself, which is desirable. On one road where a quantity of ties had been allowed to stand for about a year before being put in the track, the section foremen reported that it was more than usually difficult to drive spikes into them. This same effect is brought out in the tests conducted on the Atchison, Topeka & Santa Fe on "Long Leaf Pine Bridge Timbers," an abstract of the results of which was published recently in these columns. While these tests were carried out on long bridge timbers, and they were subjected to stresses different from those to which ties are subjected in the track, the same qualities of increased strength and toughness are desirable in both. While an increase in the time allowed for seasoning ties increases the amount of money tied up in them, at least two roads have concluded that the advantages gained by this seasoning after treatment are of sufficient importance to justify the expense and are taking the steps necessary to secure these advantages by operating their treating plants throughout the winter.

PERIODICAL BRIDGE INSPECTION.

IN a paper on "Railroad Bridge Design in Europe and America Compared," presented to the Western Society of Engineers on February 10, the author draws a number of comparisons which in general are favorable to American methods. But in discussing the testing and inspecting of bridges he takes occasion to approve the European practice. He points out that the matter of tests is given no mention in American bridge specifications while it is a prominent feature of the regulations governing design on European roads. He speaks favorably of the use of test trains, whose composition and placing are minutely given in the French railway regulations, and of the periodical inspection which is denied and required by the Prussian regulations, contrasting the practice in both these respects with that in the United States, where, he says, "such matters have been left entirely with the maintenance of way department."

While it is no doubt true that "there is not enough periodical inspection of bridges in America," the author's implication that all such inspection is handled by track men who are not competent to judge of the condition of bridges cannot be substantiated. The inspection by trackwalkers, of all bridges covered in the track inspection, is the only form of inspection that comes under the track department, and it is intended only to guard against damage to the structure from drift, high water, slides or train accidents, which would make immediate operation unsafe. In addition to such inspection there is probably not a road of importance in the country which does not have some method of bridge inspection by experienced bridge men. While they may properly be classed in the maintenance of way department on some roads, they are apparently not so classed by the author of the paper.

The fact that American specifications do not cover the testing and inspecting of bridges as is customary in Europe is no reflection on American practice. In this country a railway draws up specifications governing the design, construction and erection of bridges, work which is handled wholly or in part by contract. Since periodical inspection of bridges in service is made by company employees and not by contractors, the roads' regulations for inspection naturally take the form of instructions to the men responsible for the work. In Europe the bridge specifications are usually prepared and enforced by the governments. Design, construction and maintenance are all handled by the road or its contractor in accordance with the specifications of the governments, and for this reason all these points are covered in one set of specifications.

Although test trains for periodically determining the strength of bridges have not been used to any great extent in this country, at least one prominent road, the Pennsylvania Railroad, does use this system. Serious doubts as to its efficacy have been raised recently by bridge men because the test made on a bridge near Glen Loch, Pa., on November 26, failed to detect a condition which caused a wreck the next day.

The paper considers only steel structures, which explains the statement that "bridges that are properly designed and not overloaded practically never wear out," and the inference, in the discussion of rivet strength, that the provision for frequent inspection is tantamount to a confession that the structure is not properly designed. But, granting the truth of the first statement as to steel bridges, the second does not necessarily follow even for such structures. Inspections are made as much to avoid failures as to detect them. Under certain conditions such as a movement of the substructure or the closing of an expansion joint, the action of a properly designed bridge may be so changed as to be equivalent to a change in the loading. Even if new bridges designed according to present standards need no inspection, there are very few roads on which all structures fall within this class. Since the erection of the older bridges on most lines, train loads have increased, foundations have weakened and steel connections have deteriorated so that there are now structures in various degrees of serviceability. In addition to these, most roads have built timber structures which admittedly require careful inspection to insure their safe condition. So no road can afford to overlook regular and frequent bridge inspection.

The American Railway Engineering Association has realized this and includes in its Manual a set of instructions for bridge inspection which provides for inspection of three kinds: First, by regular track forces daily or as often as they inspect the track; second, by bridge foremen at regular intervals of from one to six months, and third, annual or semi-annual inspections by men experienced in bridge design and maintenance, and primarily responsible for the maintenance of bridges on the entire road. The association regards these three inspections as the least a road should do to make its bridges safe. A number of roads are doing even more than this, and all are gradually coming up to that standard as a minimum.

On account of the widely differing forms of organization on American roads the systems of inspection vary considerably. The inspection by track men is more uniform than the other two forms, for trackwalking by some member of a section gang is practically universal, and it is obvious that such an inspection made primarily to insure the safety of the track should also include the bridges.

There is probably greater variation in the method of making the second type of inspection than in the case of either of the other two, and many roads have not yet adopted any system which can be classed under this head. There is need, however, for some form of inspection between the frequent casual examination by an unskilled laborer and the infrequent critical inspection by a technical officer. On some roads each division has one or more bridge inspectors, who spend their time examining the structures on their territory and reporting monthly to the division officer in charge of bridge maintenance. Such men are usually picked from bridge gangs so that this inspection is not very different from that on roads which require the division bridge foreman or master carpenters to regularly examine all structures under their supervision.

On roads having a bridge engineer the technical inspection is usually made by him in person, although in some cases this is done in theory only, and inspectors from the bridge engineer's office handle most of the detailed work. In some cases the bridge engineer takes an engine and business car and makes one trip over the entire system, inspecting personally in detail all bridges of a certain span or class. In other cases the bridges are covered in a general inspection of track which is participated in by the division officials, the bridges receiving the attention of the bridge engineer, the division superintendent, the division engineer or master carpenter, and perhaps also the local bridge foreman.

Letters to the Editor.

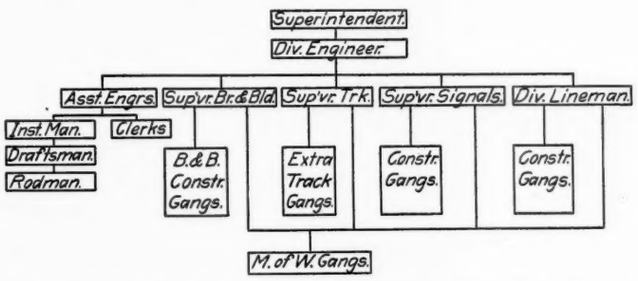
A SUGGESTED ORGANIZATION FOR COMBINED FORCES.

CHICAGO, December 20, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

There is a feeling among many operating officers that the maintenance organization should be rearranged to eliminate certain losses and effect a higher state of efficiency. Numerous ideas on the subject have been advanced, which have at least provided a foundation for further development and several practical tests are now being made, the results of which should furnish interesting data for future progress. It is a usual occurrence, under present conditions, to see men of the various departments, such as linemen, bridge men, signal men, carpenters, water service men and others, leave their division headquarters on the morning train and return on the evening train, and in the majority of cases the aggregate time spent in actual labor represents a small proportion of a day's work.

The logical solution of the problem is to establish maintenance gangs at various points on the division to maintain all structures, the mileage covered by each gang being determined by the number of coal and water stations, yards, bridges, interlocking plants, automatic signals, etc., located thereon. The section gang of today is not qualified to perform this service, although the duties of the gang might be extended to include much repair work. The section foreman has attained a certain proficiency in track



Proposed Organization for Maintenance of Way Department.

work, by many years' experience, but there are few who are mechanics or who have any perception of mechanical devices, and as most of them are middle aged men, there is slight probability that they will acquire a practical knowledge of other work. There are many men on the division who might be developed into good foremen for maintenance gangs, but there is one man who is already well qualified for the position; this man is the signal construction foreman, who is a good electrician, carpenter and blacksmith, is a good man on concrete work, is familiar with the gasolene engine and its operation, understands the use of tools, is accustomed to work from plans and blue prints and to conform to the company's standards and in fact must be an all around mechanic who will tackle anything and accomplish it in a workmanlike manner.

The organization of the gang would depend upon the particular requirements of the section in question, but in general there should be an assistant foreman, a few fair mechanics and as many laborers as are necessary from time to time. The gang should have a motor car and a standard complement of tools. With such an organization and equipment a foreman could maintain everything on a territory several times the mileage of that now covered by the section gang. He would lay out his work each day and assign the various jobs to the best advantage. Several jobs might be in progress at the same time—the foreman with some laborers repairing an interlocking plant, telegraph or telephone apparatus; the assistant foreman with a few laborers putting in new ties, a new rail or repairing a bridge, while each of the mechanics with a few laborers might be unloading company material, cleaning up the right of way and station grounds or other work. The daily patroling of the track could be assigned to capable men of the old section gang, who, while they were not doing this could help on other work.

A first class foreman could be obtained for $90 or $100 per month, but on sections that did not require an all around man the salary could, of course, be less, based on the requirements; the assistant foreman should receive from $50 to $65 per month, the mechanics from 20 to 25 cents an hour and the laborers about 15 cents an hour. In addition to providing an efficient and economical organization this arrangement would also provide an excellent training school for maintenance employees and there would be an incentive for bright young fellows to engage in the work, as there would be far greater opportunity for steady advancement than under present conditions where young men of the right kind do not seek positions on the section because the pay is low, the work mostly routine and the chance of advancement small.

The establishment of a maintenance of way gang as outlined above would necessitate a rearrangement of the division organization and the following organization is suggested. The division superintendent of today is a busy executive officer and as he has an assistant superintendent and a train master to direct transportation matters, and a master mechanic to direct motive power and equipment matters, so he should have an officer to direct maintenance of way matters, as is now the practice on some roads. As maintenance of way comprises engineering work the division engineer is the logical head to direct these matters, to whom should report the supervisor of bridges and buildings, the supervisor of track, the supervisor of signals and the division lineman, where one is required, also the assistant engineers, draftsmen, clerks, etc. The maintenance foreman should report to the division engineer through the supervisors of track, signals, etc., and receive instructions from the several supervisors. The various kinds of addition and betterment work require numerous construction and extra gangs; these gangs should be under the direction of the proper supervisor. The chart shown herewith is a graphic representation of such an organization. On a small road or on branch lines where there are few special structures or apparatus it would be an economical arrangement to send a maintenance gang over the line from station to station, as required, to make necessary repairs, the repairs to be made being determined by the division engineer from an inspection trip over the line at certain specified periods. This gang should have good bunk cars, material cars, a tool car and also a cook car when good board is not available at reasonable prices.

F. W. RIZER,
Assistant Engineer, Chicago, Burlington & Quincy.

OUR PRESENT TRACK CONSTRUCTION.

OMAHA, Neb., February 10, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In the *Railway Age Gazette* of December 20, 1912, there appeared an article entitled "Advantages of Renewing Ties to Face," by R. P. Trabue, roadmaster of the Nashville, Chattanooga & St. Louis. I attempted this about 30 years ago and am still fully convinced of the many advantages of this system, but gave it up because railroads in that day, and to an extent yet, have periods of "economizing" when unsatisfactory operating methods prevail, including the deferring of maintenance expenditures—arbitrary cutting down of requisitions for rails, ballast, ties for renewal, etc. While track which has been maintained under the ordinary method will stand two or three years of this "economizing," if in fairly good condition, it is a very serious matter if there are sections of from 2,000 to 3,000 ft. in a place that should be renewed to face.

Mr. Trabue states, in this article, that "The last advantage is what I consider the most important to be obtained by the method

of renewal of ties in continuous stretches, a more uniform degree of rail bearing. Experience with both methods of renewals has shown that the greatest safeguard against broken rails lies in the highest possible degree of uniformity of resistance of the ties. Statistics show that the number of derailments caused by the broken rails is greater than that due to any other defect of railway roadbed. (See *Railway Age Gazette* of January 12, 1912.) These same statistics show an average of one broken rail for every 714.4 rails in track, of Bessemer steel. On 139 miles of main line track on this division laid with 80 lb. rail, open hearth and Bessemer, two rails broke in 24 months, or an average per year of one broken rail for 44,480 rails in track."

The advantages of renewing ties to face are much greater in stone ballast than in gravel, chats, or dirt, both as to the cost of renewal and the uniformity of rail bearing obtained, but barring defective rails and equipment, rails break because of uneven bearings, and not because the rail cannot carry the moving load from tie to tie or with every other tie removed.

It is safe, however, to conclude that no considerable percentage of the differences shown between the broken rail record of the country at large and that of the Nashville, Chattanooga & St. Louis, is attributable to the system of tie renewal. The Nashville, Chattanooga & St. Louis has a very old and well seasoned roadbed, well drained and ballasted, and not a very heavy tonnage, in a climate where the thermometer rarely falls to zero and where the temperature is below the freezing point but a very small portion of the time. Many rails have been broken when the temperature was extremely low, and the roadbed frozen solid. Under these conditions, in some cases, 20 or 30 rails have been broken in a few hours by a single pair of flat wheels. I believe it will be conceded that no sound rail of 80 or 90 lb. section will break, except under very defective equipment, if it has even bearings at intervals of two feet which are not more compressible than timber and crushed stone and are not loaded beyond their elastic limits. By renewing ties to face approximate uniformity of bearing, so far as the action of the tie is concerned, is obtained and maintained for several years, and at all times is more nearly uniform than in the usual method. So far as the ballast is concerned a nearer approach to uniformity is possible and maintainable than when ties are put in here and there every year; but we are skating on thin ice if these differences account for five per cent. of the broken rails.

In 1881 a lot of 56 lb. rails was rolled, some of which are still doing service. If one of these old rails is taken from the track, laid on the ties and turned over and over it will be seen to have a succession of kinks in every direction from one end to the other. These rails have rarely broken and they have carried loads on dirt track which have broken 80 lb. rails on ballasted track. The axle loads have more than doubled since these rails were rolled and while then our high speed trains were made up of light passenger equipment, they now have axle loads as great or greater than our freight. Add to this the fact that we have raised the center of gravity of our engines in the meantime probably two feet, until they are undesirably high and as high as designers dare make them, causing a rolling which greatly increases the vertical load on one rail or the other; the increase in dynamic effect of the unbalanced part; the fact that the present high stiff rail cannot adjust itself to the uneven bearing upon the ties as the light limber rail could; that it is difficult, if not impossible, to make the present heavy rail compare with the old 56 lb. rail in quality; and that the whole load rests on the same width of sub-grade as before; and we will find, I believe, that the service calls not for 80, nor 90, nor 100 lb., but for 120 lb. rails to insure the same degree of safety, so far as broken rails are concerned, as we had with the 56 lb. rail.

Rails rest directly on ties that are continually decaying and failing in their support. The change that takes place in the course of the life of a tie is enough to make proper support of the rail by the tie impossible, regardless of the condition of ballast and sub-grade. The tie rests on ballast of various kinds which is continually working and grinding and crushing, and even when of such a nature that it is not affected by frost or water, it is continually failing in its support, and more rapidly in some spots than in others. In turn, the ballast rests on earth material subject to great variation in its ability to support ballast owing to the different degrees of moisture and frost action which may also lift places of varying sizes and abruptness, so we see we are dependent on three undependable factors for bearings for our rails.

Considering the rail as a continuous girder, loaded in a specific way, and leaving out of consideration the accidental excessive loading due to flat wheels and other equipment defects, we do not know the length of span nor the initial stresses necessary to make the girder take its bearings. In fact, we do not know what our rails are subjected to with any degree of certainty. The heavy axle loads have undoubtedly come to stay and to increase still further, while our track design is becoming more and more unsuitable. The old oak pole tie, once in the majority, is falling further and further into the minority. By heavier rail, tie plates, screw spikes, timber treatment, more ballast, better drainage, and by the never ending tamp, tamp, tamp, of the section men the losing fight is prolonged only to finally force the adoption of a track design that will transmit the load on the rail to a level below the action of the elements making it relatively permanent, and positive in action.

There are no signs of an evolution from the present position to a scientific solution of the problem, and every radical change in the plan of railroad track supports thus far suggested involves greatly increased first cost, and doubtful results. The necessity for extensive and very expensive experiments at this time is apparent, but it is hardly likely that the required funds for any real improvement along these lines will be available so long as the roads are in the hands of inexperienced, ignorant, and hostile committees, commissions and politicians. In fact, it seems more probable that if the present trend of affairs continue for another five years it will be impossible to meet the requirements for transportation even as efficiently and safely as at present.

E. Holbrook,
Special Engineer, Union Pacific.

ABSTRACT OF ENGINEERING ARTICLES SINCE JANUARY 24, 1913.

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the regular weekly issues of the *Railway Age Gazette* since January 24, 1912:

Lift Bridges Over the Buffalo River.—The construction of three movable bridges replacing fixed spans over the Buffalo river at Buffalo, N. Y., involved some interesting work, particularly in the substructures. The piers for one of these bridges consisted of pairs of cylinders which were built inside of steel sheet piling cofferdams. This work was described in an article by Emile Low, consulting engineer, Buffalo, N. Y., in the issue of January 31, page 197.

A Continuous Rail.—A composite rail having a removable head which is cramped over a base section, the two sections having staggered joints, was described in the issue of January 31, page 207.

American Wood Preservers' Association.—The election of officers and business at the closing session of the Wood Preservers' convention which were too late to include in the last maintenance section, were mentioned in the issue of January 31, page 217.

Base Failures in Rails.—A letter by Paul M. La Bach, assistant engineer, C. R. I. & P., commenting on the causes of base failures in rails, was published in the issue of February 7, page 237.

An Analysis of Steel Ingot Manufacture.—A discussion of the six ingot defects to which forging steel is ordinarily liable and the means for correcting them, written by Bradley Stoughton, consulting engineer, New York, was published in the issue of February 7, page 245.

The Grand Central Terminal, New York.—The new Grand Central Terminal, New York, opened for service Sunday, February 2, which is one of the most unusual passenger stations in the world, was illustrated and described in the issue of February 14, page 279.

A Large Car Ferry.—A new ferry boat, the "Contra Costa," which will be the largest ferry boat in the world, being built by the Southern Pacific for operation between Port Costa, Cal., and Benicia, was described in the issue of February 14, page 288.

D., M. & N. Station at Hibbing, Minn.—The construction of a combined concrete and timber station for a small city was described in the issue of February 14, page 291.

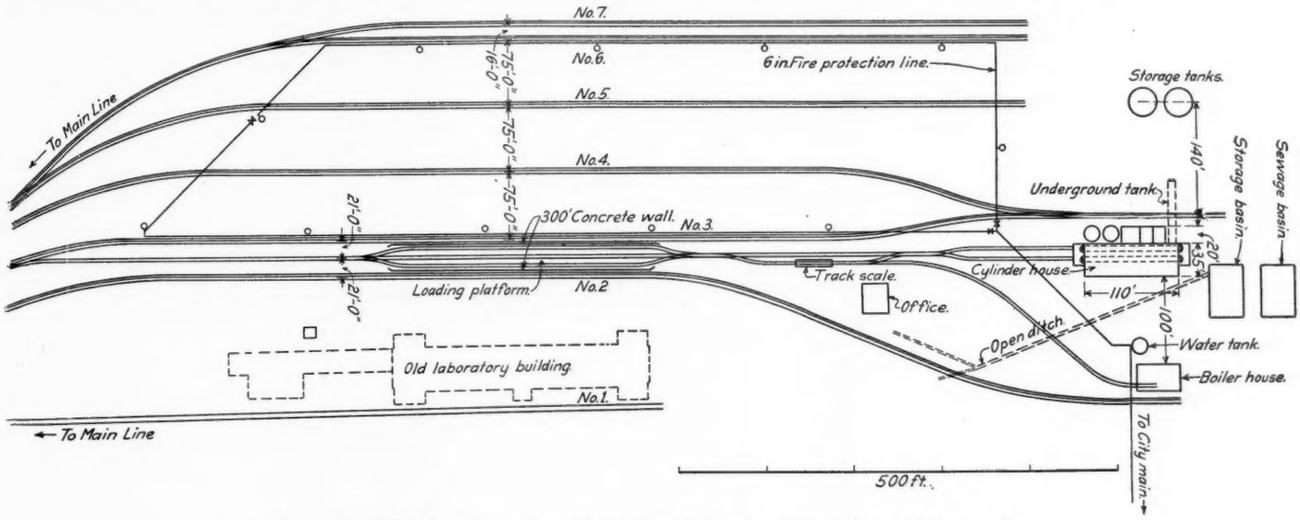
TREATING PLANT FOR CENTRAL OF GEORGIA.

The Recently Completed Facilities at Macon, Ga., for Preserving Ties and Timber by Three Alternative Processes.

During the early part of December, 1912, the Central of Georgia started to operate its new wood preserving plant at Macon, Ga. Before the construction of this plant the officers of the road made extensive investigations throughout the country as to the best manner in which to preserve their ties and, since from 50 to 60 per cent. of the ties they were using were oak and cypress, and the rest inferior long leaf yellow pine, they decided to treat the pine ties with the empty cell creosote process, the oak ties with zinc chloride, and all piling, bridge and trestle timbers with the full cell creosote process.

They decided to locate the plant at Macon, Ga., which is near the center of the system and makes a very good receiving and distributing center. It is just outside the city on the main line to Atlanta, where the company owned about 80 acres of available property, high and dry, with good drainage. The creosote storage tanks were located at Savannah, so that the tank steamers from Europe, which bring in the principal supply for this plant, could discharge directly into the storage tanks. A total storage capacity of 1,000,000 gal. is provided in two tanks.

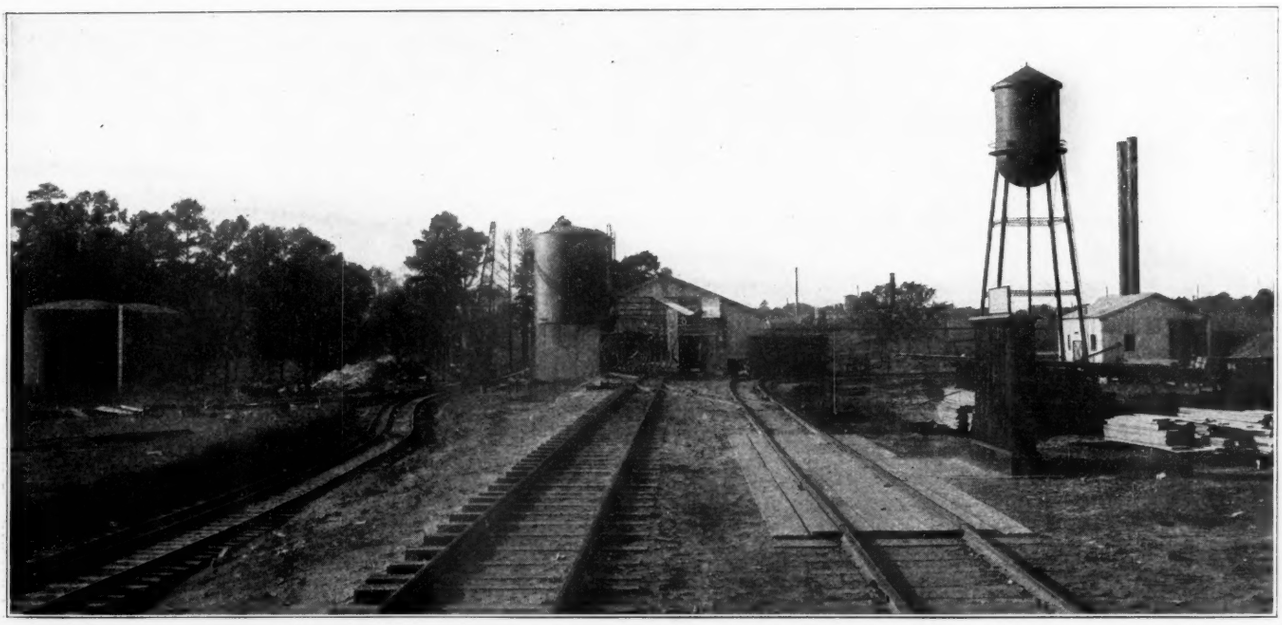
The present yard consists of seven tracks, leading from the main ladder, all arranged for both the 36 in. gage and the standard gage equipment. The main ladder is laid with 70-lb. rails and the storage tracks with 56 lb. The plant is located at the opposite end of the yard from the main line connection, with the loading platform between the ladder and the cylinder building.



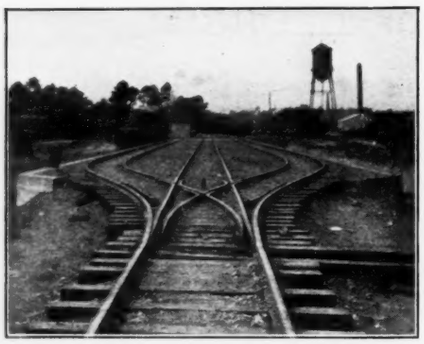
Layout of Timber Treating Plant for Central of Georgia at Macon, Ga.

The boiler house and storage tanks are located 100 ft. and 140 ft., respectively, from the cylinder house in opposite directions in order to reduce the fire risk. A 6-in. fire line is also provided around the storage yard, which is connected to a 1,000 gal. fire pump and a 50-ft. tank having a capacity of 50,000 gal. All buildings are of steel construction.

The loading platform is located about half way between the cylinder house and the ladder tracks. It is 300 ft. long, with

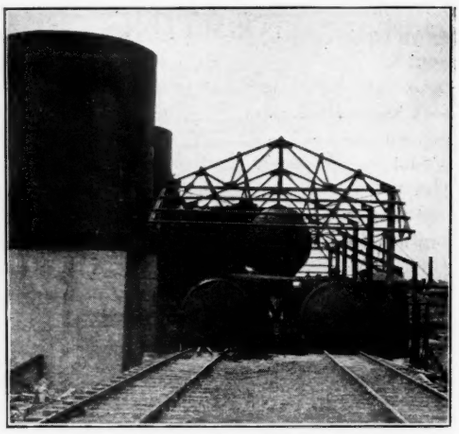


Storage Tanks, Working Tanks, Cylinder House, Water Tank and Boiler House at Central of Georgia Treating Plant.



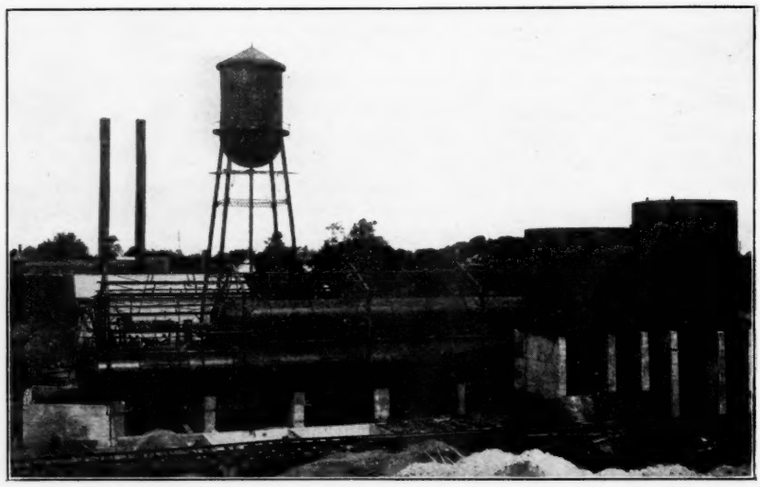
The Loading Platform.

One of the Shelter Houses for Hose Reels Along the Fire Protection Line.



End View of Cylinders.

Piling Timbers with Locomotive Crane.



Side View of Cylinders and Measuring Tanks Under Construction.

three-rail tracks on each side which are 42 ft. center to center. This platform is 4 ft. high with walls of reinforced concrete retaining an earth fill. On this fill are laid three 36-in. gage tracks. Between the cylinder house and the loading platform there is located a track scale in order to check the treatment from time to time as may be necessary. This is a narrow gage scale of 50 tons capacity of the Fairbanks type, with registering beam for recording exact weights.

The creosote is transported to the plant from the storage tanks at Savannah in 10,000-gal. tank cars, which are set in on track No. 3, over a cylindrical underground tank. When the creosote has been heated to the proper temperature, the bot-

Rear View of Boiler House, Cylinder House and Storage Tanks at Macon Plant.

tom connection of the tank car is opened and the creosote drops by gravity into the underground tank in a few minutes. Two general service pumps located in a pit at one end of this tank pump the creosote to the two storage tanks, and from them to the working tanks as it is needed. This arrangement has proved to be economical for handling hot creosote with the least trouble. The storage tanks have a capacity of 150,000 gal. each, and the working tanks 44,000 gal. each.

Fused zinc chloride in drums is delivered in box cars which are also set on track No. 3. The drums are stored in the zinc chloride room, where they are emptied directly into a concrete mixing sump near the underground tank from which the chemical is syphoned into No. 1 overhead tank as needed in the treatment.

The cylinders are 7 ft. in diameter by 116 ft. long, made of ¾ in. flanged steel plate and designed for a working pressure of 200 lb. per sq. in. The cylinders are set up on concrete foundations so arranged that a man can walk under them. The cylinders have a combination pressed steel and cast steel door on each end, which are strong, light and easy to handle. Just above the two working cylinders is located an air and creosote reservoir or Rueping cylinder and on the inside of the building, adjacent to the cylinders, are two 7,000 gal. measuring tanks, which are direct connected to the pressure pumps, cylinders and outside measuring tanks. The two working tanks just outside of the building, are set up on reinforced concrete piers, and these tanks are so arranged that the Rueping cylinder, as well as the measuring tanks in the building, can be filled by gravity.

The piping is so arranged that the zinc chloride treatment can be carried on in either cylinder while the Rueping or full cell process is being carried on in the other. For maintaining the pressure on the cylinders there are two pot valve pressure pumps designed for a working pressure of 300 lb. per sq. in. A Deane vertical uniplex vacuum pump is used to create a vacuum in the cylinder, and an Imperial type air compressor having a capacity of 650 cu. ft. of free air per minute furnishes compressed air to operate the Rueping process and blow back the creosote to the working tanks. One end of the cylinder house is partitioned off to form a shop and generator room which contains a 10 k. w. generator and switchboard furnishing light to the plant and yard.

The boiler house contains two 150 h. p. Scotch marine internal furnace boilers, having a working pressure of 130 lb. per sq. in. In this boiler house there is also located the fire pump mentioned above, a boiler feed pump, and a Hoppes feed water heater. The steam line from the boiler house to the cylinder house and the return exhaust line are carried in overhead steam pipes, making a very neat arrangement.

A Porter locomotive weighing 47,000 lb. is used for handling the narrow gage tram and bolster cars as well as the standard gage cars in the yard. The locomotive is of 36 in. gage with special cast steel bumpers on each end.

C. K. Lawrence, chief engineer, and J. B. Maddock, engineer of bridges and buildings of the Central of Georgia, had supervision over the building of this plant, and Grant B. Shipley, Pittsburgh, Pa., was the consulting engineer. The plant is operated under the direction of Mr. Lawrence, J. H. Stewart being the superintendent in charge.

NEW LINE FOR GERMAN EAST AFRICA.—The German East African Central Railway will, it is announced, be opened for traffic this summer, two years before the arranged time. The line will run from the coast at Dares-Salaam, and cross the colony in a westerly direction to Tabora, one of the most important trading centers in the East African lake district. The length of the railway will be nearly 550 miles. The German government has determined to push on with the building of the remaining portion of the line as far as Ujiji, on Lake Tanganyika.

AN ACREAGE TABLE.

By James G. Wishart,
Chief Draftsman, Chicago, Rock Island & Pacific, Chicago.

The table of acreages shown herewith is for use primarily in figuring railroad right-of-way. This property is usually of uniform width, the majority of it being 100 ft. wide. Where this is the case, the acreage for strips in lengths of even hundreds may be found directly in the first double column of the table. The acreage for lengths less than 100 ft. can be taken directly from the second and third double columns. By adding together quantities taken from two of these columns, the acreage for any strip 100 ft. wide up to 6,100 ft. long can be determined directly. The acreage of right-of-way in other widths than 100 ft. can be determined by taking the acreage for a 100 ft. width and multiplying it by the proper width expressed decimally. The acreage of irregular tracts can be found by first reducing them to parallelograms. This table will be found especially valuable as a time saver in valuation work, tax reports, etc., where the right-of-way acreage is required to be shown in quarter sections.

AREAS OF 100 FT. STRIPS OF LAND FOR LENGTHS GIVEN IN ACRES.

Length.	Area in Acres.	Length.	Area in Acres.	Length.	Area in Acres.
100	.2296	1	.002296	51	.117080
200	.4591	2	.004591	2	.119375
300	.6887	3	.006887	3	.121671
400	.9183	4	.009183	4	.123967
500	1.1478	5	.011487	5	.126262
600	1.3774	6	.013774	6	.128558
700	1.6070	7	.016070	7	.130854
800	1.8365	8	.018365	8	.133149
900	2.0661	9	.020661	9	.135445
1,000	2.2957	10	.022957	60	.137741
1,100	2.5252	11	.025252	1	.140036
1,200	2.7548	12	.027548	2	.142332
1,300	2.9844	13	.029844	3	.144628
1,400	3.2140	14	.032140	4	.146924
1,500	3.4435	15	.034435	5	.149219
1,600	3.6731	16	.036731	6	.151515
1,700	3.9027	17	.039027	7	.153811
1,800	4.1322	18	.041322	8	.156106
1,900	4.3618	19	.043618	9	.158402
2,000	4.5914	20	.045914	70	.160698
2,100	4.8209	1	.048209	1	.162993
2,200	5.0505	2	.050505	2	.165289
2,300	5.2801	3	.052801	3	.167585
2,400	5.5096	4	.055096	4	.169880
2,500	5.7392	5	.057392	5	.172176
2,600	5.9688	6	.059688	6	.174472
2,700	6.1983	7	.061983	7	.176767
2,800	6.4279	8	.064279	8	.179063
2,900	6.6575	9	.066575	9	.181359
3,000	6.8870	30	.068870	80	.183654
3,100	7.1166	1	.071166	1	.185950
3,200	7.3462	2	.073462	2	.188246
3,300	7.5757	3	.075757	3	.190541
3,400	7.8053	4	.078053	4	.192837
3,500	8.0349	5	.080349	5	.195133
3,600	8.2644	6	.082644	6	.197428
3,700	8.4940	7	.084940	7	.199724
3,800	8.7236	8	.087236	8	.202020
3,900	8.9532	9	.089532	9	.204316
4,000	9.1827	40	.091827	90	.206611
4,100	9.4123	1	.094123	1	.208907
4,200	9.6419	2	.096419	2	.211203
4,300	9.8714	3	.098714	3	.213498
4,400	10.1010	4	.101010	4	.215794
4,500	10.3306	5	.103306	5	.218090
4,600	10.5601	6	.105601	6	.220385
4,700	10.7897	7	.107897	7	.222681
4,800	11.0193	8	.110193	8	.224977
4,900	11.2488	9	.112488	9	.227272
5,000	11.4784	50	.114784	100	.229568
5,100	11.7080				
5,200	11.9375				
5,300	12.1671				
5,400	12.3967				
5,500	12.6262				
5,600	12.8558				
5,700	13.0854				
5,800	13.3149				
5,900	13.5445				
6,000	13.7741				

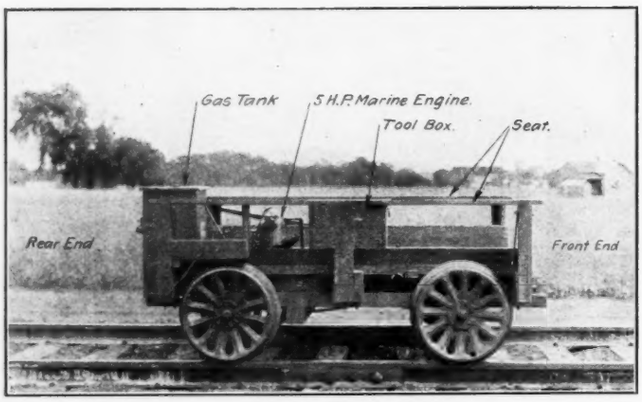
PREVENTING TRACK BOLTS FROM RUSTING.—To prevent the nuts rusting on track bolts, the track walkers on the Pittsburgh & Lake Erie are supplied with a brush and a can of inferior grade lubricating oil. About once a year they oil the nuts with the brush as they make their regular track inspections. It is found that this practice very largely eliminates the necessity of cutting the nuts with a chisel when disconnecting the rail, and the proportion of bolts fit for further use after removal is much above the average.

A "HOME-MADE" MOTOR CAR.*

By W. K. Walker,
Division Engineer, Missouri Pacific, Wichita, Kan.

As carpenter gangs are the highest paid laborers in regular maintenance work, it is necessary to get all work in their line done in the least time possible. On a line in a prairie country, with maintenance work consisting mainly of light repairs, such as renewing a few caps, stringers, sway braces, etc., one will readily realize that a bridge gang consisting of a foreman and eight bridge carpenters spends considerable time in going from one bridge to another. The repairs required for each structure are determined by a supervisor, a bill of material is made out and the material for each structure is unloaded from a local freight train ahead of the work. The carpenter gang follows and makes the needed repairs.

About 18 months ago I designed a home-made motor car to transfer the men from job to job quickly. The wheels, axles and boxes of an ordinary push car were used, to which was fastened a frame, 5 ft. wide x 6 ft. 6 in. long. On each side of the frame was placed a running board for the men to sit on when going to or coming from work. Located in the center and near the rear end of the car is a 5 h. p. marine engine which drives the car



A Home Made Motor Car.

by a chain drive and sprocket wheel connected to the front axle. The car has two speeds. The slow speed, from five to eight miles an hour, is used when making the heavier pulls and the high speed, from 20 to 25 miles an hour, is ordinarily used in going to and from work. The engine is water cooled and has dry battery ignition. The car is so arranged that a push car can be coupled behind it. No trouble is experienced in carrying nine men on the car and pulling the push car loaded with tools, etc., while the car is frequently used in transferring stringers, caps, etc., from place to place. Cost of the car was as follows:

Engine complete	$65.00
Labor and material constructing car	40.00
Other small parts	15.00
Total	$120.00

With a car of such small cost doing the work it does, one familiar with bridge work in a prairie country can very readily realize the saving from the investment. The cost of operation for oil and supplies is approximately two cents per mile traveled. From a close record of work accomplished by the car, I find that since it has been in operation an average daily saving of $2 has been made.

Snow Sheds on Transandine Railway.—The Chilean government has decided to spend $1,459,950 on the snow sheds, for better protection of the Transandine Railway from Los Andes to the tunnel through the mountains to the Argentine side. Traffic has been badly blocked during the winter months ever since the road was opened in April, 1910.

*Received in the contest on Bridge Kinks, which closed June 25, 1912.

COST OF RAILROAD CONSTRUCTION.

The following figures of cost of railroad construction west of the Rocky mountains have been compiled from the known cost of over one thousand miles of new railroad recently built on different lines, and while they are not an exact guide for estimates, or for work where conditions are special, they show an excellent average for modern railroad construction, with heavy rails, steel bridges over all important streams, high class ballast, timber lined tunnels and 3,500-ft. sidings 8 miles apart.

Engineering—Including general preliminary reconnoissances and locations with ample revisions, average per mile	$2,530
In heavy mountainous country	5,215
In moderately mountainous country	2,980
In fairly level country	1,190
Grading—With unit prices for solid rock 80 to 90 cents; loose rock, 38 to 42 cents; earth, 16 to 20 cents, per cubic yard; clearing, $45 to $50 per acre; grubbing included in grading. Average per mile of main line	22,100
In heavy mountainous country	120,500
In rolling country	7,860
In fairly level country	6,840
Tunnels—Average per lineal foot	94
In serpentine, fairly wet, lined	96
In hard limestone, dry, no lining	78
In rotten granite, shale, volcanic rock, wet, lined	92
In earth and broken limestone, wet, lined	151
Lining—Maximum, $24; minimum, $8.65.	
Bridges, trestles and culverts—Average per mile	3,160
In heavy mountainous country	8,800
In fairly level country, no large streams, no high trestles, no steel spans	570
In rolling country, no large streams	1,260
Ties—Spaced 2,880 per mile of track; average	2,270
Rails—85-lb.	5,100
Frogs and switches	160
Track fastenings and other materials	850
Ballast—9 in. below the tie	610
Maximum, $660; minimum, $573.	
Track laying and surfacing	1,160
Telegraph and telephone lines—Per mile	165
Station buildings and fixtures—Exclusive of all large stations	220
Engine house and turntables—Per mile of line	450
Machinery and tools for engine house	175
Water stations	575
Fuel stations	160
Legal expenses	400
Stationery and printing	47
Insurance and taxes	300

The foregoing table omits a number of items of cost which would be of no value if reduced to a per mile basis, and others which are special to each railroad. Readers who are interested in new railroad projects will do well to note that these figures of actual cost largely exceed the irresponsible and optimistic estimates which are generally given by promoters.

FACILITIES FOR CURVING RAIL.

By M. Ganley,
Roadmaster, Atchison, Topeka & Santa Fe, Argentine, Kan.

As more attention is being given each year to the proper curving of rail before placing it in the track, the importance of well arranged facilities for doing this work is increasing. The following arrangement has been found to work very satisfactory. A roadmaster can usually find some isolated track in a terminal opposite which he can build a platform about 70 ft. long and 10 or 12 ft. wide. This platform should be built level with the floor of a flat car and can be made of old car sills or other convenient material. A roller rail bender is bolted down about in the middle of the platform and a small sationary engine with a hoisting drum is placed at one end. An iron hook is fastened to the rope line leading to the drum.

When rail is to be curved, a carload of rail is set alongside the platform at the end opposite the engine and the rail is unloaded. One rail is then placed in the bender and the bender adjusted for the required curvature. The rails are then pulled through the bender one at a time by the hoisting engine and drum.

A gang of 18 men and a foreman have curved 180 rails in a day in this way. If the rail was being curved out on the road, the work would not be done as uniformly and the progress would be very much slower. Before undertaking to curve rails, the exact length and degree of curve for which the rail is intended should be furnished the foreman by the engineering department. The foreman can then curve and load it.

SERVICE TESTS OF TIES IN EXPERIMENTAL TRACK.

Results Indicate That Treatments Have in General Increased the Durability of These Ties Over Similar Untreated Material.

The Forest Service in co-operation with various railways now has in service eight test tracks in various parts of the country in which the life of various kinds of ties and fastenings is being very carefully watched. With the exception of those ties in the track of the Chicago, Milwaukee & St. Paul which were treated in the experimental cylinders in the Forest Products Laboratory all the treated ties were prepared in commercial plants. The results of these tests are published in a bulletin of the Forest Service by Howard F. Weiss, director of the Forest Products Laboratory.

GULF, COLORADO & SANTA FE TRACK.

The oldest experimental track is that of the Santa Fe between Pelican and Cleveland, Tex., in which 5,477 ties were placed in February, 1902. The results of this test have been reported annually in these columns, the last report appearing in the issue of July 26, 1912. This test was designed to obtain information, first, as to the durability of ties made from untreated beach, hemlock, black, red, Spanish, turkey, white and willow oak, loblolly, longleaf and shortleaf pine, and tamarack; and second, as to the efficiency of the Allardyce, Burnett, Hasselmann and Wellhouse processes, and of preservative treatments with Beaumont oil, with spirittine, and with zinc chloride in combination with Beaumont oil and with English creosote. From this test the conclusions are drawn, first that zinc chloride is an effective preservative for ties subjected to the severe conditions under which these were laid; second, that a fairly heavy impregnation of zinc chloride is advantageous; third, that a light injection of creosote apparently adds to the effectiveness of zinc chloride treatments; fourth, that treatment with preservatives will not yield good results unless the ties are sound in the first place and the treating is properly done; fifth, that the great variation in durability of the different species in nearly all of the treatments indicates that some of the species were not properly treated, and sixth, that species which, when untreated, decay most rapidly appear to give the greatest relative increase in service when treated.

NORTHERN PACIFIC TRACK AT PLAINS, MONT.

There were 2,650 hewed ties placed in the main line of the Northern Pacific in 1907 in gravel ballast with good drainage conditions. This line is single track with a very heavy traffic. The objects of the tests were to ascertain the durability of green and air-seasoned untreated Douglas fir and western larch ties; the durability of burnettized Douglas fir and tamarack ties, and the efficiency of the flanged, flat, and wooden tie plates when used with cut or screw spikes. The ties were treated with a 6 per cent. solution, receiving an injection of 0.786 lbs. of dry zinc chloride per cu. ft. After being in the track four years an inspection showed that none of the ties indicated any marked difference in relative durability; Douglas fir ties were not checking as badly as the western larch ties; ties treated with zinc chloride were more rail-worn than untreated ties of the same species; untreated larch ties were more rail-worn than untreated Douglas fir ties, but were not as badly worn as the treated ties of either species; the flat metal plates were causing the ties less damage than any of the other plates used; flanged tie-plates caused more checking and brooming than flat ones. Wooden plates did not prove serviceable, as they worked out from under the rail and split badly; they did not prevent wear, of the ties; and, because of lack of support under the head, the screw spikes tended to become bent by the lateral thrust of the rail.

NORTHERN PACIFIC TRACK AT MAYWOOD, WASH.

About 2,280 sawed ties were placed in the main line of the Northern Pacific near Maywood, Wash., in the fall and winter of 1906-7. One 2 deg. and one 5 deg. curve are included in this test. The track is well drained, with gravel ballast. The objects of the test were to determine the durability of green and air-seasoned untreated Douglas fir and western hemlock ties; the durability of creosoted Douglas fir ties; the efficiency of flat tie-plates in preventing wear; and the relative efficiency of screw and cut spikes as rail fastenings. Four hundred and fifty air-seasoned Douglas fir ties were treated by the full-cell process. An inspection in June, 1911, showed that the green, untreated hemlock ties were beginning to deteriorate quite rapidly; the Douglas fir ties seemed to be better than the hemlock regarding checking, rail wear, brooming and decay; and, the creosoted Douglas fir ties were decidedly more rail cut than the untreated ties.

CHICAGO & NORTH WESTERN TRACK NEAR JANESVILLE, WIS.

About 3,040 hewed ties were placed in the main line of the Chicago & North Western, in December, 1907, to determine the natural durability of eastern hemlock and tamarack ties; the comparative efficiency of the Burnett, Wellhouse and open-tank creosote processes; the comparative efficiency of flat and flanged metal tie-plates and creosoted wooden plates; and of cut and screw spikes used with treated ties. The ties were treated with a 4 per cent. solution of zinc chloride, receiving an average injection of 12 lbs. per cu. ft. Those treated in open-tank with coal tar creosote absorbed about 15 lbs. per tie. On an inspection made in May, 1911, it was found that approximately 15 per cent. of the untreated hemlock and 13 per cent. of the untreated tamarack ties were so badly decayed that they were unserviceable, and that in addition, about 8 per cent. of the hemlock and 30 per cent. of the tamarack were affected with decay to a lesser extent; only two of the treated ties showed any evidence of decay; about 44 per cent. of the hemlock and 60 per cent of the tamarack ties which were untreated and unprotected by plates were rail cut to a depth varying from one-fourth to one-half inch, and practically all showed rail wear to some extent; there was no apparent difference in the condition of the ties equipped with flat plates and cut spikes, and those equipped with flat plates and screw spikes; many of the flanged plates were still only partially embedded in the ties and gravel was found under a good many of them; the damage to the ties with wooden plates appeared to be less than to those otherwise protected, but some of the plates were missing and many were split and damaged; lack of support under the outer portion of the head of the screw spikes had, in some cases, resulted in the spikes bending outward from the rail.

INDIANAPOLIS, COLUMBUS & SOUTHERN TRACTION COMPANY, NEAR TAYLORSVILLE, IND.

About 945 hewed ties were laid in the Indianapolis, Columbus & Southern Traction Company's tracks, in September, 1909. The roadbed was well drained; with gravel ballast. The object of the test was to secure the comparative efficiency of red and black oak ties treated with coal-tar creosote by the full-cell process, zinc creosote, and "asphaltic crude oil," using low pressures. Those ties treated with creosote were boiled in the oil at a temperature not exceeding 225 deg. F. from one to four hours, after which a pressure not exceeding 45 lbs. per sq. in. was applied until the desired absorption was obtained. Those treated with creosote and zinc chloride were first heated to 212 deg. F., after which they were impregnated with a 4½ per cent. solution of zinc chloride under a pressure of not more than 45 lbs. per sq. in. In the treatments with "asphaltic crude oil" the injection was very light. On account of the viscous nature of the oil it was not possible to apply pressure exceeding 20 lbs. per sq. in. with the apparatus used. After being in the track

two years an inspection showed no badly decayed ties, although approximately 2 per cent. of those treated with about 14 lbs. of creosote per cu. ft., and approximately 12 per cent. of those treated with creosote and zinc chloride were slightly affected by decay; and a number of the ties of each treatment were more or less split on the ends. In practically all such cases, however, the exposed portions of the ties appeared thoroughly sound and well treated, and it is probable that the greater part of the splitting existed at the time of treatment. Only two of the ties showed any rail wear, and this was so slight as to be negligible.

OTHER TEST TRACKS.

Early in 1910, 920 sawed ties were placed in a track of the Birmingham Southern at Ensley, Ala., in slag ballast and poor drainage. The test was designed to secure information regarding the natural durability of longleaf pine and white oak ties and also the comparative efficiency of "cresol-calcium" and coal-tar creosote in protecting shortleaf pine, loblolly pine and red-oak ties from decay when treated by the low pressure process. These ties have been in too short a time to enable any conclusions to be drawn.

In July, 1910, 100 ties were placed in the main track of the Wenatchee Valley & Northern near Delmont, Wash. The ties were hewed on two faces with the bark on the other two and have not been in sufficiently long to furnish any results.

In August, 1911, 1,711 hewed and sawed ties were placed in the main line of the Chicago, Milwaukee & St. Paul near Hartford, Wis., on a well drained roadbed with gravel ballast. On about half of these ties are placed flat steel plates with a boss under the spike heads for screw spikes. The rest are unplated and the rail is fastened with cut spikes. The object of the test was to determine the natural durability of red oak and hard maple ties; the efficiency of the Burnett, Card, zinc-creosote, full-cell creosote, Rueping, and crude-oil treatments in protecting red oak and maple, and the kyanizing process in protecting spruce ties from decay; and the efficiency of flat-bottom plates when laid with screw and cut spikes in protecting ties from mechanical wear. Because of the short length of time this track has been in, it has not been possible to secure any results up to the present time.

In general, the results from these various test tracks indicate that with one exception, the treatments have increased the durability of the ties over those of similar untreated material. It is not economical to tie-plate ties with low decay resistance, such as loblolly, hemlock, beech and tamarack, if laid untreated, as they will decay, before they fail from mechanical wear. The increased resistance to decay secured from preservatives, makes it desirable to protect treated ties from deterioration by mechanical agencies. The experience gained thus far is not conclusive as to the best form of plates to use. Wooden plates, when simply laid under the rail, have not proved satisfactory, while flanged metal plates have a decided tendency to split the tie. The metal plates with flat or slightly corrugated bottom have thus far given the best results.

ROCK ISLAND LINES' ANNUAL TRACK INSPECTION.

The results of the annual track inspection of the Chicago, Rock Island & Pacific, which was made in December, 1912, has recently been made public. Prizes of $100 were awarded to the roadmasters whose track showed the greatest improvement on one division, or a group of divisions, while a prize of $50 was awarded the foreman making the greatest improvement on each roadmaster's subdivision. On this basis prizes of $100 each were awarded to roadmasters G. W. Kohn, Peoria, Ill.; T. H. O'Brien, Atlantic, Ia.; A. Burke, St. Joseph, Mo.; C. H. Gruver, Albert Lea, Minn.; J. Dulin, Oskaloosa, Ia.; J. Singleton, Des Moines, Ia.; V. B. Simpson, Eldon, Mo.; J. G. Hutchison, Clay Center, Kan.; C. B. Lane, Dalhart, Tex.; J. J. Breheny, Fairbury, Neb.; M. Dunnean, Goodland, Kan.; J. A. Trainer, Booneville, Ark.; R. T. Gollehon, El Dorado, Ark.; D. Bogue, Haileyville, Okla.; G. Woods, El Reno, Okla., and W. H. Gruhlkey, Amarillo, Tex. Forty-nine prizes of $50 were also awarded to section foremen.

THE TREATMENT OF DOUGLAS FIR WITH CREOSOTE OIL.*

By G. A. Coleman,
Coleman Creosoting Co., Seattle, Wash.

It is well known that Douglas fir is more difficult to treat than most eastern and southern pines. It is not surprising, therefore, that early operators, failing or having only indifferent success with the methods used for softer woods, should cast about for a more efficient treatment. As a result of these efforts but little new has been brought out. Two systems, nevertheless, have survived—the steam and vacuum process, refined and adapted to new conditions, and a new timber; and the boiling process. Good work can be done by the latter when conditions are ideal, but the great variety in the grain and density, and condition of seasoning of timber, especially piling, when treated in commercial quantities, renders the work very irregular, so much so, that in common practice from 5 to 8 per cent. of the treated material has to be returned for re-treatment. By the steaming process fairly uniform work can be obtained, as the effect of steaming is to render the timbers equal as to moisture, so that during the vacuum, the real drying period, the seasoning goes forward uniformly.

Unless first water seasoned, sun baked or air seasoned, timber cannot be successfully treated by the boiling process, as no part of the treatment has any effect on that hardened condition characteristic of Douglas fir. Results show that piling taken directly from the boom to the retorts will frequently have a penetration of 1½ in. on the under or wet side after treatment by the boiling process, while the upper or dry side will have almost no penetration. The effect of steaming is somewhat similar to that of water seasoning. Early operators undoubtedly failed with the steaming process, because of plants poorly equipped for maintaining adequate temperatures under the vacuum, and attempted to make up the deficiency by excessive steaming, sometimes as long as 24 hours, which is far beyond the point of safety. There is a critical point somewhat beyond the time of being heated through, beyond which steaming should not be carried, and which must necessarily vary with the dimensions of the timber. Yet, that wood may be subjected to a high temperature for a short period without serious injury is often demonstrated in the burning of mill constructed buildings. Large wooden columns in a fire of several hours will sometimes be half consumed, and yet under the charred surface the wood will retain practically all of its original strength. Wooden columns of sufficient size are preferred to unprotected iron by insurance companies on account of this remarkable quality.

There is quite a difference of opinion between operators upon the Pacific coast regarding the relative merits of these two processes. The plant with which the writer is connected uses either, as specified by the purchaser, but has been able to obtain the best results by the steam and vacuum process. This is evidenced by the fact that out of 14,000 piles treated during the past seven months by this plant, but 1,100 have been treated by the boiling process. Timber can be severely injured by either process if care is not taken, but the best tests we have so far made of wood treated by the boiling process show a depreciation of 23 per cent.; while one test showed 33 per cent. This depreciation is excessive and is no doubt accounted for by the long boiling period of 30 to 48 hours in oil heated to a temperature of 225 deg. Fahr.

It is announced that the Forestry Department will soon pub-

*Abstract of a paper read before the ninth annual convention of the American Wood Preservers' Association, held in Chicago, January 21-23, 1913.

lish a report upon 9 in. x 16 in. timber treated by this process which will give us further information on this important point. Recent preliminary tests by the same laboratory on creosoted piling steamed six and seven hours, which is common practice, showed the excellent result of less than 10 per cent. depreciation, while an over-steamed test which showed a depreciation of 38 per cent. immediately after treatment, while yet soft, on further seasoning, recovered to 90 per cent. of its original strength.

It is not necessary, however, to extend the steaming beyond the point at which the timber becomes thoroughly heated through and uniform in moisture content. After the steaming, a vacuum, the most refined drying process known to the industrial arts, is begun and maintained at temperatures well below the boiling point until the wood is dry enough to receive the oil. The low average temperature at which this system of treatment is carried on undoubtedly accounts for the comparatively slight depreciation. That the fuel consumption per cubic foot of treated material is fully 25 per cent. less gives added evidence of the less heat units applied. In conclusion, therefore, in the opinion of the writer, two points recommend the steaming process, uniformity of penetration and a minimum depreciation.

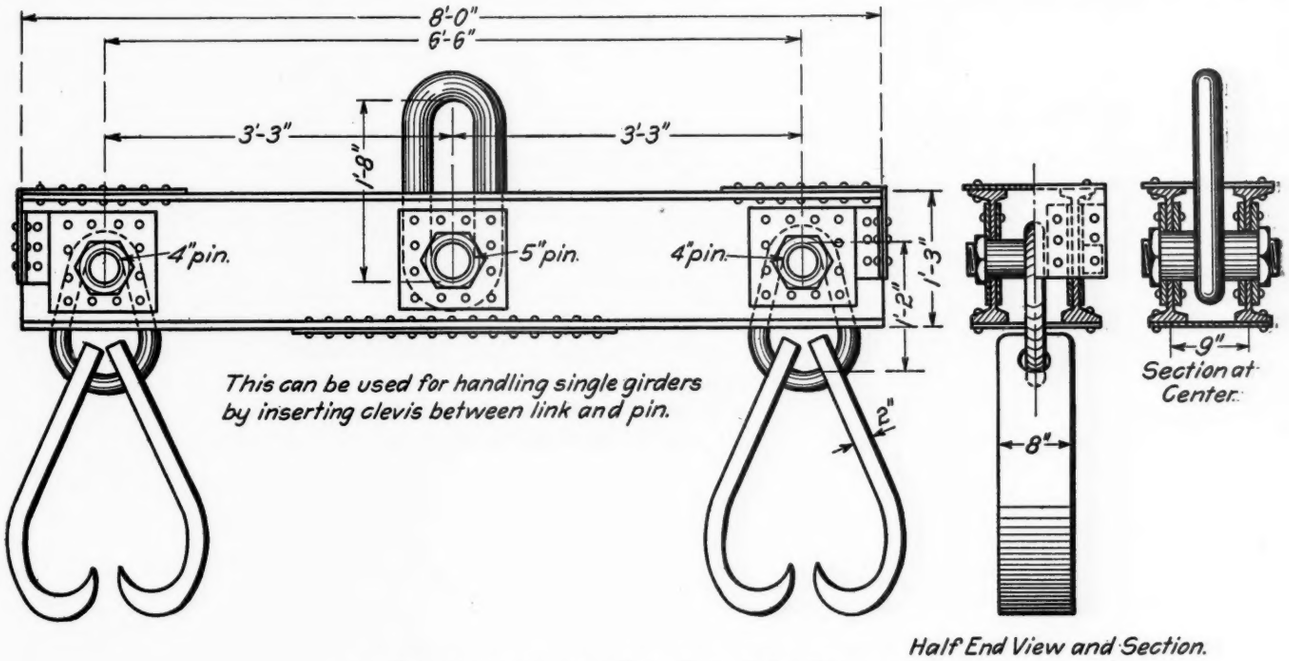
ERECTING HOOKS FOR HANDLING DECK PLATE GIRDER SPANS.

By N. W. McCallum,
Supervisor of Structures, New York Central & Hudson River, New York City.

The amount of time allowed for erecting plate girder spans in place of old structures on lines carrying a heavy traffic is frequently very limited and any device which will cut down the amount of time required for such work is of much assistance. The erecting hooks shown on the drawing were devised by one of the bridge foremen of the Mohawk division of the New York Central & Hudson River, and the details were perfected in the office of the bridge supervisor a number of years ago. They were planned especially for use in erecting a bridge across the Mohawk river at Schenectady, which consisted of ten four-track deck plate girder spans about 70 ft. long, making 40 spans to be installed. The old spans to be removed were approximately the same length, center to center of girders, so that the same hooks were also used in lifting them out. Since that time these hooks have been used in placing all other deck plate girders on this division. They have also been used for handling single girders by knocking out the end pins and putting in a clevis on the link carrying the hooks.

The device consists essentially of a built up steel section with a supporting link at the center and with two clamps on each end to pick up the girders. These clamps are spaced 6 ft. 6 in. between centers, the standard width center to center of girders for deck plate girder bridges on this road, for spans of approximately the length referred to.

Most of the deck girders are shipped already assembled. The steel is put in place with a wrecking crane, the top link of the balance beam hooks being passed over the hook on the load block of the crane. Each pair of hooks of the balance beam engages the top flanges of each girder of the assembled span. If the spans are too long to handle with one wrecking crane, two are used, one at each end, with a set of balanced beam hooks for each. These hooks save from seven to ten minutes time on each lift over the old method of handling such spans with chains, the saving depending, of course, on the size of the span and the weight of the chains.



Erecting Hooks for Handling Deck Plate Girder Spans.

A SHORT METHOD FOR LOCATING FROG POINTS.

The following tables have been prepared by J. L. Taylor, assistant division engineer, Grand Rapids & Indiana, for the quick and accurate location of frogs. These tables are based upon methods outlined in "Modern Location of Standard Turnouts," by C. M. Kurtz of the Southern Pacific. The values of "g" are based upon the dimensions of the standard frogs used by a number of the roads, the overall dimensions of which are 8 ft. for rigid frogs Nos. 4 to 6, inclusive, and 15 ft. for spring frogs Nos. 7 to 10 inclusive. It will be noted that the distance "g" is given as 8 ft. 6 in. for the No. 7 frog. If a No. 7 rigid frog is to be employed where "g" equals 5 ft., the values of "n" and "d" shown can be used, unless one is crowded for room, when corrected values of "n" and "d" can be readily obtained so that the curve can start at the actual heel of the shorter frog. On the other hand, if larger values of "g" are required, as in cases where some tangent is desired behind the

TABLE OF TURNOUT MEASUREMENTS.

g = 5′ 0″ m = 19.00
b = 5.91 s = 4.26
f = 14° 15′ 00″

No. 4 Frog

Curve Deg.	Min.	n	d
15		90.03	—5.88
15	30	87.01	—5.50
16		84.17	—5.14
16	30	81.51	—4.81
17		79.01	—4.50
17	30	76.65	—4.20
18		74.42	—3.92
18	30	72.31	—3.66
19		70.31	—3.41
19	30	68.42	—3.17
20		66.62	—2.95
20	30	64.91	—2.74
21		63.28	—2.53
21	30	61.72	—2.34
22		60.24	—2.15
22	30	58.83	—1.98
23		57.47	—1.81
23	30	56.18	—1.64
24		54.94	—1.49
24	30	53.75	—1.34
25		52.60	—1.20
25	30	51.51	—1.06
26		50.45	—0.93
26	30	49.44	—0.80
27		48.46	—0.68
27	30	47.52	—0.56
28		46.61	—0.45
28	30	45.74	—0.34
29		44.90	—0.23
30		43.29	—0.03
31		41.79	0.15
32		40.39	0.33
33		39.07	0.49
34		37.84	0.65
35		36.67	0.79
36		35.57	0.93
37		34.53	1.06
38		33.54	1.18
39		32.61	1.30
40		31.73	1.41

g = 5′ 0″ m = 23.75
b = 5.69 s = 4.43
f = 11° 25′ 16″

No. 5 Frog

Curve Deg.	Min.	n	d
12		90.29	—3.78
12	30	86.52	—3.40
13		83.03	—3.06
13	30	79.81	—2.73
14		76.81	—2.43
14	30	74.03	—2.16
15		71.42	—1.90
15	30	68.99	—1.65
16		66.71	—1.42
16	30	64.57	—1.21
17		62.55	—1.01
17	30	60.65	—0.82
18		58.86	—0.64
18	30	57.16	—0.47
19		55.56	—0.31
19	30	54.03	—0.16
20		52.59	—0.01
20	30	51.21	0.13
21		49.90	0.26
21	30	48.65	0.38
22		47.46	0.50
22	30	46.32	0.61
23		45.23	0.72
23	30	44.19	0.83
24		43.19	0.93
24	30	42.23	1.02
25		41.31	1.12
25	30	40.43	1.20
26		39.58	1.29
26	30	38.77	1.37
27		37.98	1.45
27	30	37.23	1.52
28		36.50	1.60
29		35.11	1.74
30		33.82	1.87
31		32.62	1.99
32		31.49	2.10
33		30.43	2.20
34		29.43	2.30
35		28.50	2.40

g = 5′ 0″ m = 28.50
b = 5.54 s = 4.54
f = 9° 31′ 39″

No. 6 Frog

Curve Deg.	Min.	n	d
12		74.63	—1.06
12	30	71.48	—0.80
13		68.57	—0.55
13	30	65.87	—0.33
14		63.37	—0.12
14	30	61.04	0.07
15		58.87	0.26
15	30	56.83	0.43
16		54.93	0.58
16	30	53.14	0.73
17		51.45	0.87
17	30	49.86	1.01
18		48.36	1.13
18	30	46.95	1.25
19		45.60	1.36
19	30	44.33	1.47
20		43.12	1.57
20	30	41.97	1.66
21		40.87	1.75
21	30	39.83	1.84
22		38.83	1.93
22	30	37.88	2.00
23		36.97	2.08
23	30	36.10	2.15
24		35.27	2.22
24	30	34.47	2.29
25		33.70	2.35
25	30	32.96	2.41
26		32.25	2.47
26	30	31.57	2.53
27		30.91	2.59
27	30	30.28	2.64
28		29.67	2.69
29		28.51	2.79
30		27.44	2.88
31		26.43	2.96
32		25.49	3.04
33		24.60	3.11
34		23.77	3.18
35		22.98	2.25

g = 8′ 6″ m = 33.25
b = 5.93 s = 8.08
f = 8° 10′ 16″

No. 7 Frog

Curve Deg.	Min.	n	d
10		73.46	0.11
10	30	69.59	0.38
11		66.06	0.63
11	30	62.85	0.86
12		59.91	1.07
12	30	57.20	1.27
13		54.70	1.45
13	30	52.38	1.62
14		50.23	1.76
14	30	48.23	1.91
15		46.36	2.04
15	30	44.62	2.17
16		42.98	2.28
16	30	41.45	2.40
17		40.00	2.50
17	30	38.63	2.60
18		37.35	2.69
18	30	36.13	2.78
19		34.98	2.85
19	30	33.88	2.94
20		32.84	3.01
20	30	31.86	3.08
21		30.92	3.14
21	30	30.02	3.21
22		29.16	3.27
22	30	28.35	3.33
23		27.57	3.38
23	30	26.82	3.44
24		26.10	3.49
24	30	25.41	3.54
25		24.75	3.58
25	30	24.12	3.63
26		23.51	3.68
26	30	22.93	3.72
27		22.36	3.76
27	30	21.82	3.80
28		21.30	3.84
28	30	20.79	3.87
29		20.30	3.91
30		19.38	3.94

g = 8′ 6″ m = 38.00
b = 5.79 s = 8.14
f = 7° 9′ 10″

No. 8 Frog

Curve Deg.	Min.	n	d
1		705.29	—38.80
1	20	526.84	—27.65
1	40	419.93	—20.96
2		348.59	—16.51
2	20	297.63	—13.32
2	40	259.42	—10.93
3		229.69	—9.07
3	20	205.92	—7.59
3	40	186.46	—6.37
4		170.25	—5.36
4	20	156.53	—4.50
4	40	144.78	—3.77
5		134.59	—3.13
5	20	125.68	—2.57
5	40	117.81	—2.08
6		110.81	—1.64
6	20	104.56	—1.25
6	40	98.93	—0.90
7		93.84	—0.58
7	20	89.21	—0.29
7	40	84.98	—0.03
8		81.11	0.22
8	20	77.55	0.43
8	40	74.26	0.64
9		71.21	0.83
9	20	68.38	1.01
9	40	65.75	1.17
10		63.29	1.33
10	20	60.99	1.47
10	40	58.84	1.60
11		56.82	1.73
11	20	54.91	1.85
11	40	53.12	1.96
12		51.42	2.07
12	20	49.82	2.17
12	40	48.30	2.26
13		46.86	2.35
13	20	45.49	2.44
13	40	44.19	2.52
14		42.95	2.60
14	20	41.76	2.67
14	40	40.64	2.74
15		39.56	2.81
15	20	38.52	2.87
15	40	37.54	2.93
16		36.59	3.00
17		33.98	3.16
18		31.66	3.30
19		29.58	3.43
20		27.71	3.55

g = 5′ 68″ m = 42.75
b = 5.68 s = 8.18
f = 6° 21′ 35″

No. 9 Frog

Curve Deg.	Min.	n	d
1		626.50	—29.58
1	20	467.83	—20.77
1	40	372.63	—15.48
2		309.17	—11.95
2	20	263.84	—9.43
2	40	229.84	—7.54
3		203.40	—6.08
3	20	182.25	—4.90
3	40	164.94	—3.94
4		150.52	—3.14
4	20	138.32	—2.46
4	40	127.86	—1.88
5		118.79	—1.37
5	20	110.86	—0.93
5	40	103.87	—0.54
6		97.65	—0.20
6	20	92.08	0.11
6	40	87.07	0.39
7		82.54	0.64
7	20	78.42	0.87
7	40	74.66	1.08
8		71.22	1.27
8	20	68.05	1.45
8	40	65.12	1.61
9		62.41	1.76
9	20	59.90	1.90
9	40	57.55	2.03
10		55.37	2.15
10	20	53.32	2.26
10	40	51.41	2.37
11		49.61	2.47
11	20	47.91	2.56
11	40	46.31	2.65
12		44.81	2.74
12	20	43.38	2.82
12	40	42.03	2.89
13		40.75	2.96
13	20	39.53	3.03
13	40	38.37	3.09
14		37.27	3.15
14	20	36.22	3.21
14	40	35.21	3.27
15		34.25	3.32
15	20	33.34	3.37
15	40	32.46	3.42
16		31.62	3.47
17		29.29	3.60
18		27.22	3.71
19		25.38	3.82
20		23.71	3.91

g = 8′ 6″ m = 47.50
b = 5.58 s = 8.22
f = 5° 43′ 29″

No. 10 Frog

Curve Deg.	Min.	n	d
1		563.31	—23.00
1	20	420.43	—15.85
1	40	334.70	—11.57
2		277.56	—8.71
2	20	236.73	—6.67
2	40	206.12	—5.14
3		182.31	—3.95
3	20	163.26	—2.99
2	40	147.68	—2.21
4		134.69	—1.57
4	20	123.70	—1.02
4	40	114.28	—0.55
5		106.12	—0.14
5	20	98.98	0.22
5	40	92.68	0.54
6		87.08	0.82
6	20	82.07	1.07
6	40	77.56	1.29
7		73.48	1.50
7	20	69.77	1.68
7	40	66.38	1.85
8		63.28	2.01
8	20	60.42	2.15
8	40	57.79	2.28
9		55.35	2.40
9	20	53.08	2.51
9	40	50.97	2.62
10		49.00	2.72
10	20	47.16	2.81
10	40	45.44	2.90
11		43.82	2.98
11	20	42.29	3.05
11	40	40.85	3.13
12		39.49	3.19
12	20	38.21	3.26
12	40	36.99	3.32
13		35.84	3.38
13	20	34.74	3.43
13	40	33.70	3.48
14		32.70	3.53
14	20	31.76	3.58
14	40	30.85	3.63
15		29.99	3.67
15	20	29.16	3.71
15	40	28.37	3.75
16		27.62	3.79
17		25.52	3.89
18		23.66	3.98
19		22.00	4.07
20		20.50	4.14

g = 12′ 0″ m = 71.25
b = 5.54 s = 11.82
f = 3° 49′ 06″

No. 15 Frog

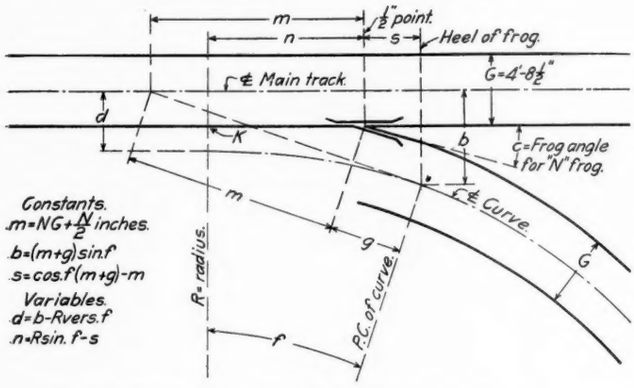
Curve Deg.	Min.	n	d
0	30	751.28	—19.90
0	40	560.51	—13.54
0	50	446.04	—9.72
1		369.74	—7.18
1	10	315.23	—5.36
1	20	274.35	—4.00
1	30	242.55	—2.94
1	40	217.12	—2.09
1	50	196.31	—1.40
2		178.96	—0.82
2	10	164.29	—0.33
2	20	151.71	0.09
2	30	140.81	0.45
2	40	131.28	0.77
2	50	122.86	1.05
3		115.38	1.30
3	10	108.69	1.52
3	20	102.66	1.72
3	30	97.21	1.91
3	40	92.26	2.07
3	50	87.73	2.22
4		83.59	2.36
4	10	79.77	2.49
4	20	76.25	2.60
4	30	72.99	2.71
4	40	69.96	2.81
4	50	67.14	2.91
5		64.51	3.00
5	10	62.05	3.08
5	20	59.75	3.15
5	30	57.58	3.23
5	40	55.54	3.29
5	50	53.02	3.36
6		51.80	3.42
6	10	50.08	3.48
6	20	48.46	3.53
6	30	46.91	3.58
6	40	45.44	3.63
6	50	44.05	3.68
7		42.72	3.72
7	10	41.45	3.76
7	20	40.25	3.80
7	30	39.09	3.84
7	40	37.98	3.88
7	50	36.93	3.92
8		35.91	3.95
8	30	33.11	4.04
9		30.62	4.13
9	30	28.39	4.20
10		26.38	4.27

main track frog, corrected values of "n" and "d" are easily obtained as follows:

Corrected "d" = "d" (from table) + additional length × sin f.

Corrected "n" = "n" (from table) — additional length × cos f.

If corrected "n" is a minus quantity, the frog point is located on the side of "k" opposite that shown in the illustration. In maintenance work where the main or ladder track is a tangent, the accompanying tables are complete in themselves for either office or field work. In staking out new tracks, the parallel tangent distant "d" from the center of the main tangent can be used for the base line and intersections for diverging tracks can be made directly on this parallel tangent. Even when it is



A Short Method of Locating Frog Points.

desired to locate a turnout in a track already built to connect with a diverging fixed tangent, the intersection between the two tangents can be made directly at a point distant "d" from the center of the main tangent, reducing the field work necessary to ascertain the tangent distance for the assumed curve for the given intersection angle, as all other necessary distances are readily secured from the tables.

REMOVING SNOW SLIDES BY BLASTING.

At this season of the year when snow becomes a serious obstacle in the operation of trains, especially in the mountains, the following information relative to the use of dynamite, which was used for clearing the tracks in one instance, is of timely interest.

As a result of a slide across the line of one of the western railways the snow was banked about 40 ft. over the rails for a distance of about 600 ft. Because of similar slides at other points along the line, the forces clearing the track were unable to reach this particular slide for a period of 24 hours. At the time the slide occurred the weather was mild and the snow very soft, but it turned cold and the snow froze hard. When the rotary plow reached this point it was able to make little progress. It was suggested that the snow be moved by dynamite and although there were some fears of damage to the track, authority was given to try this method. Three 1¼ in. steel bars each 18 ft. long were welded together and forced through the snow to a distance of about 35 ft., or almost down to the track. Four or five cartridges of 40 per cent. dynamite were placed in this hole and fired by electricity as a springing charge. This hole was then loaded with 62 kegs of blasting powder and exploded, as a result of which the snow was removed to within about a foot of the track. Two or three similar shots cleared the remainder of the slide in about three hours' time so that the rotary could complete the work and open the line. Careful examination showed that the track had not been damaged. As a result of this experiment, the road has since used several carloads of blasting powder for this service with a large saving in time and money.

THE SECTION FOREMAN PROBLEM.*

BY B. A. WEST,

Roadmaster, Atchison, Topeka & Santa Fe Ry., Pueblo, Colo.

I have been employed as track laborer, section and extra gang foreman and roadmaster, holding the latter position for the past 13 years, so I think I realize fairly well the problem of the future supply of track foremen. I have now as laborers Mexicans, Italians, Greeks and a very few Americans. My practice in training foremen is about as follows:

While around section, yard and extra gangs I carefully note the action and methods of the men in doing their work, the handling of their tools and the interest they take. Whenever a man impresses me as capable I carefully question the foreman regarding the length of time he has worked, his habits, his education, his family, his willingness and his ambition. If I am satisfied with the answers to these questions I place him on some important section, or in a yard where he can be employed steadily and where he can learn track work most rapidly and best. Whenever the regular foreman is called away this man is left in charge of the gang, or if material is needed this man is sent for it, and if he proves capable in these small duties I place him in a gang where a sub-foreman is needed. I have it understood by all foremen as well as laborers that the instructions of sub-foremen are to be obeyed just the same as those of the foremen. By selecting Americans from among our laborers I find that they have acquired to a certain extent the language of the foreigners and understand their method of working and their temper. They can direct such laborers to much better advantage than foremen who might be transferred from another part of the road and who had never had experience with these particular foreigners.

It is evident to me that the railways must depend almost entirely upon the foreigners for laborers in the track department, and for this reason the future supply of track foremen will have to be drawn largely from that class. In selecting men for foremen I make no distinction between the native white and the foreigner, and if a foreign laborer shows efficiency and intelligence and is more suitable than any available American, I place him as foreman. I always place a foreigner in charge of a gang of his own nationality. I always caution a foreign foreman to keep himself neat and make the men in his gang do the same, to keep their cars and bunk houses cleaned up, and to refrain from carrying dangerous weapons or quarreling with each other. I impress upon him the necessity for overcoming the local prejudice against foreign labor, and I find that such foreign foremen in many instances get better results out of their men than an American hobo foreman who has never handled foreigners. The only drawback to making good foremen out of foreigners is their inability to read and write, making it hard for them to keep their labor distribution and reports correctly. When they learn the language I find foreign foremen just as competent as American foremen, in fact, some of them are better bookkeepers than the Americans.

Foremen should be kept posted at all times by quarterly meetings with the heads of the maintenance department; if not quarterly, these meetings should be held at least semi-annually. The men should be educated to transfer material and keep a correct record of the transfer, to make light repairs to depots or stock chutes, to set fixed signals, to patch holes in depot platforms, to replace window panes in depots, section or bunk houses, to note material required for repairs in stock yards or on chutes, to unload material for water-treating plants, and similar small jobs by which they could easily save the company more than the amount of their wages. The men also might properly be trained to take care of bonded track and to maintain automatic signals and crossing bells. I have seen a $3-a-day man sent out to fix a window pane who had to spend the en-

* Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

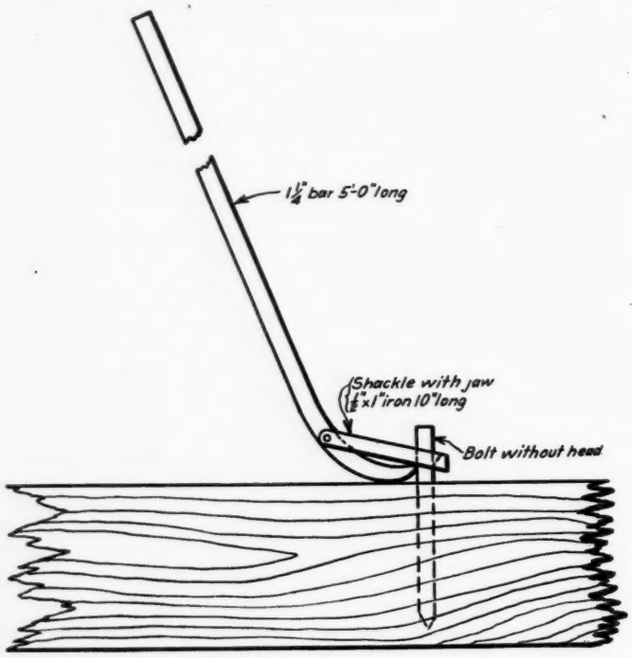
tire day on a job which could have been done in twenty minutes. I have seen five or six men at $2.75 a day sent out to unload a part of a car of treated water supplies and spend an entire day at it when a foreman and his gang could have done the same work in an hour's time. My suggestion is to educate foremen to do this work, and pay them a few dollars per month to induce them to make the effort necessary to learn to handle this work. Roadmasters and supervisors should be educated as well as the foremen. It might not be practicable to place all of the departments under one supervising head, but I suggest that there are at least several departments connected with maintenance of way that could be so combined with a resulting increase in efficiency.

A BOLT PULLER.*

By H. C. SWARTZ,

Master of Bridges and Buildings, Grand Trunk, St. Thomas, Ont.

The shackle bar is of use for withdrawing bolts without heads, as shown in the illustration. By pressing down on the bar the toe of the bar and the shackle grip two sides of the bolt and the harder the bar is pressed down the tighter is the grip. By raising the bar slightly the shackle is loosened and a new grip can be secured. Where the bolt is too far down in the timber to secure a grip, a little adzing will usually enable the device to secure a hold on the bolt.



Shackle Bar for Withdrawing Bolts from Timber.

TIMBER FOR CREOSOTED BLOCK PAVING.†

By HARRY G. DAVIS,

Manager Paving Department, Chicago Creosoting Co., Chicago, Ill.

There are several commercial woods in the Central West available for paving purposes, any of which are sufficiently strong for the purpose, and selection can be made from these as determined by the more technical features of wood preservation, such as the adaptability of the wood to treatment, and its power to withstand decay after treatment. These woods are Southern yellow pine, tamarack, hemlock and maple. The writer has had no opportunity to study Norway pine. One street paved in Chicago with black gum is not considered a sufficiently conclusive experiment to warrant one in forming a definite opinion as to that wood.

The writer knows from actual experience that each of these woods is adapted to treatment. Observations made at our plant during the past year show that maple is most easily treated, followed closely by tamarack and hemlock, all three greatly outclassing yellow pine in this respect. There is no doubt that hard maple is the strongest of the four, followed next by yellow pine, and then by tamarack and hemlock. But each is sufficiently strong for paving purposes.

*Submitted in the contest on Tools, which closed August 25, 1912.

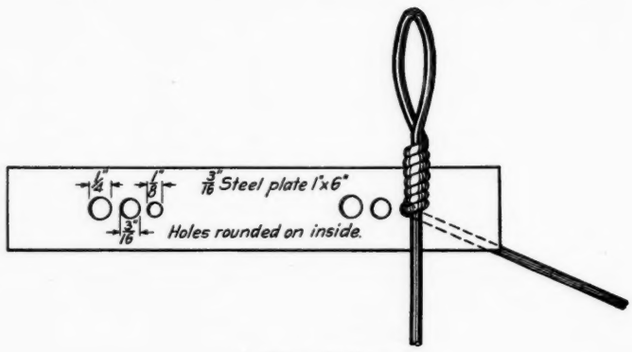
†Abstract of a paper read before the ninth annual convention of the American Wood Preservers' Association, held in Chicago, January 21-23, 1913.

A WIRE SPLICER.*

By H. C. SWARTZ,

Master of bridges and buildings, Grand Trunk, St. Thomas, Ont.

The wire splicer shown on accompanying drawing is used to splice wires without taking out the temper as is apt to be the case when the wire is wound without pinchers. This splicer is of special use in connection with semaphores where the wire has to be covered and passes through pipes filled with oil, it being necessary to connect up the hardened wire in the pipes with the regular semaphore wire at either end. It is also useful in making "tell tales" for overhead bridges and for making coil springs.



A Wire Splicer.

PROPER USE OF TOOLS TO AVOID INJURY.†

By E. K. COGGINS,

Chief Clerk to Roadmaster, Southern Railway, Knoxville, Tenn.

Many of the so-called unavoidable accidents that result in personal injury to maintenance of way employees would never happen if the foreman or man directly in charge of the work would perform his duty in taking the proper precaution to look after the safety of the men working under him. It very often happens that a section laborer or bridge man gets a badly smashed hand or loses one or more fingers, and the report of the accident simply shows that the party was injured while handling or setting a lever or ratchet jack. The fact is not brought out in the investigation that he was a new man who had not been instructed and that the injury could have been avoided if the foreman had taken a moment to explain the proper and safe way to handle the jack, had shown him that if the trigger or trip was sprung the jack would fall and had told him how easily he could be hurt if not careful.

Railroad companies spend a great deal of money to provide the proper tools and equipment for safe handling of heavy material, and a great many personal injuries could be prevented

*Received in the contest on Tools, which closed August 25, 1912.

†Received in the Safety contest, which closed October 25, 1912.

by the proper use of the same. Men are crippled every day by the careless handling of rail or heavy bridge timbers by hand, when the injuries could easily have been prevented and time and money saved in the work by using rail tongs, timber hooks, dollies, etc., which, if not on the ground, have probably been left on the cars or at the tool houses.

PREPARING FOR THE SEASON'S WORK.

BY ENGINEER.

It is almost a truism that there is great economy in having work done at the proper time. When it is delayed the amount to be done increases rapidly, so that it takes more work to accomplish the same results. This is as true in railroad work as in any other line of industry, and in this article we would call attention to the great importance of having maintenance of way work done in the proper season. If it is neglected or postponed, its cost is increased, delays to operation are occasioned by inferior track and other delays result from the necessity for doing the work when the volume of traffic has greatly increased.

The coming month is the season of preparation for active spring work in the maintenance department which should start as soon as the frost is out of the ground. In the southern part of the country, where work can go on the entire year, this preparation is not so important, but in the northern and central states where it is still too cold for active work on the track, preparation should be made by deciding on what is to be done and making arrangements to carry it forward as soon as the weather will permit.

The larger items of new construction, improvements and repairs should have been fully decided on before this, so that in a general way the amount to be done during the coming season is known. It remains to decide on the details and determine what smaller repairs shall be made. The amount of ballast to be used on each division and branch should have been allotted; the number of ties each section is to have, and the amount of rail relaying to be done should have been fully investigated and settled by the higher officers; and maintenance forces should be making preparations for going ahead with all work, so that it will be completed in its right order.

The proper officer should make requisition for all material required, stating when and where it will be needed, so that the supervisor or roadmaster, the master carpenter and men in charge will know when to expect it and the supply department will have advance information and will not be behind in having the material on hand. The ordering of material may be emphasized as the first and most important work for this season of the year. If plans are not finished they should be completed at once and all officers who will have to do with handling the work should be fully advised as to what is to be done, and consulted as to the best method of doing it. All officers in charge of forces, supervisors, roadmasters, master carpenters, signal and telegraph superintendents, should have all tools examined to see that they are in shape for the season's work. Those needing it should be sharpened and repaired, useless tools should be discarded and needed additional tools ordered for all regular or extra gangs they expect to put to work. All gangs should be organized, on paper at least, so that when the time comes it will only be a question of giving the orders to get the work under way. It should not be necessary to make unforeseen shifts of foremen from one place to another, or of men, because it was not known they would be wanted. Work trains should be anticipated and trainmasters should arrange for them.

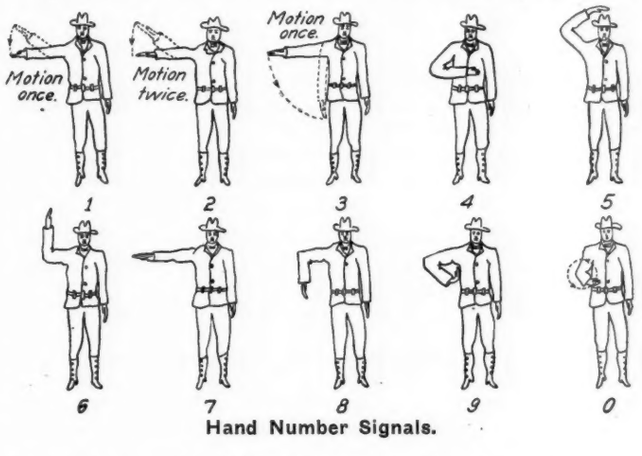
The supervisor should go over his track in detail with the section foremen to spot all weak places; to note what ties should be replaced and what rails should be taken out (except where a general renewal is to be made); to see that farm and highway crossings need to be put in good shape, especially when any have been moved on account of flangers; to see that fences and gates are ready for the heavier use they will get in the spring and that the section foremen are alive to the necessity of closely watching places that are shimmed so as to get the shims out and keep the track surfaced up promptly as the frost goes out. Just as the frost goes out, the track should be very closely watched, as in a few hours what was apparently a very well surfaced and safe piece of track may become a very rough and unsafe piece. Thick shims should be replaced by thinner and constant attention is needed to keep the track smooth. Experience has taught foremen the localities where this is likely to happen, for there are other localities where shims are unknown and this trouble is not serious.

Drainage should be looked after, so that when the spring thaws and rains come no damage will be done, and so that the track will not be soft and troublesome. Ditches, culverts and bridges should be cleaned and put in shape. The master carpenter should go over all his bridges and see what is needed at each of them, whether the piles are all sound and whether any of the timbers need renewing. Buildings should all be examined and repairs decided on, screens repaired or ordered, painting decided on, platforms gone over and needed repairs listed, sidewalks, streets, driveways and all plankings and pavements examined with a view to keeping them in good condition.

With these ordinary repairs decided on and material ordered arrangements should be made for getting men as early in the season as work can be begun. In the more southerly states, rail laying, putting in ties and ballasting may begin during March, but in the northerly states that is likely to be too early. Preparation should be made, however, to have the men ready to start the heavy work as early in the season as the weather will allow. "The early road catches the hobo." The best men are out early and the cheapest work is that done in the very early spring.

HAND NUMBER SIGNALS FOR ENGINEERS.

The need of communicating between two or more members of surveying parties in the field is frequently felt, and is often rendered difficult by the lack of an understanding regarding proper signals. A simple system of signs or symbols indicating numbers has been extensively used on location and maintenance parties on the Burlington lines west of the Missouri river. These symbols, which are indicated on the accompanying sketch,



Hand Number Signals.

are quickly learned, easily given and easily read, so that communication is rendered easy between a transitman and head chainman, or between other members of a party. These signals are shown on a blue print 3¾ in. x 7 in., suitable for mounting in a loose leaf book with other similar blue prints showing track and switch layouts, or the print can be pasted in the back of a field book. We are indebted to F. T. Darrow, engineer of maintenance of way, Burlington lines west of the Missouri river, for this information.

CAUSES OF INJURY IN THE MAINTENANCE OF WAY DEPARTMENT.*

By E. H. Barnhart,
Assistant Division Engineer, Baltimore & Ohio, New Castle, Pa.

On the division with which I am connected there are 380 miles of main track maintained by 55 foremen under four supervisors. During the past year the minimum number of men employed in any one month was 465, and the maximum number 1,110. There were 42 personal injuries and one death to maintenance of way employees working on or about the track on the division during the year. Comparing the personal injuries with the average number employed during the year, one out of every 8,659 men was killed while one out of every 206 was injured.

It is interesting to note, in this connection, the comparison of injuries to those working under American foremen and those working under foreign foremen. Of the 55 foremen mentioned above, 11 men, or 20 per cent., are foreign born. Of the 42 personal injuries, 14 occurred to men working under foreign foremen. Thus, while only 20 per cent. of the foremen are foreigners, 33 1/3 per cent. of the total number of injuries occurred under their supervision.

An analysis of the manner in which these personal injuries occurred is pertinent here, and, from this analysis, conclusions may be drawn and remedies applied. For purposes of analysis, these causes will be classified under general heads, viz.:

Tools slipping, including misplacing jacks, bars, etc.	7
Flying spawls from tools, account using defective tools	4
Handling heavy material, men not working together	15
Careless use of hand cars—running too fast, men falling off, etc.	6
Weather conditions, slipping on ice, etc.	3
Foot caught in interlocking	1
Trackwalker riding local freight to where gang was working	1
Falling through car door while unloading material	1
Jumping from train on piece of coal	1
Miscellaneous	3

From the above analysis it is seen that the first five causes are responsible for about 80 per cent. of the personal injuries occurring during the year.

In my opinion there are five principal causes contributing to between 80 and 90 per cent. of the accidents to maintenance of way employees.

First.—Trackmen working on track do not pay proper attention to the work or are not careful to observe the movement of trains. It may seem strange that I should place this first, in view of the above analysis. Local conditions, however, are responsible for there being no accidents due to this cause. Of the main track mileage maintained, only about 26 per cent. is curved track, thus affording a good view to approaching trains. Another reason is due to the fact that, during October of last year, the Baltimore & Ohio published a book of rules in eleven different languages for the government of employees working on or about the tracks. These were distributed among foremen who were required to receipt for them. Rule 4 of this book reads as follows: "On the approach of a train, employees who are working on or about the track must move to a place of safety, standing clear of all running tracks. They must not walk or stand on the track except when necessary for the proper performance of their duties." We have been endeavoring to impress upon the foremen the importance of this rule, and, while all are not strictly observing it, the results shown above are very encouraging. This rule should be strictly enforced wherever possible on double track railroads.

Second.—Improper handling of heavy materials, such as rails, ties, etc. Thirty-five per cent. of our personal injuries during the past year occurred from this cause. Good results could be obtained if the foremen would designate some one of the laborers to act as spokesman when handling heavy material and require all of the men to lift or let go at his word. It would be well, also, to caution each man when it is necessary to handle any material. Constant care and watchfulness on the part of the foreman is needed, especially with the very large number of foreigners employed.

Third.—Improper handling of tools was responsible for 16 per cent. of the personal injuries. Here, again, the foreman should exercise constant care and watchfulness in the placing of jacks and in the use of mauls, claw bars, etc. Foremen cannot caution their men too frequently about exercising extreme care in the handling of tools. Supervisors should also be constantly on the lookout, in their frequent trips over the road, for the improper use of tools which are liable to cause injury to laborers.

Fourth—Careless use of hand cars caused 15 per cent. of the personal injuries. Our men all have instructions not to use hand cars in a fog; not to go around dangerous curves without proper protection and to keep themselves posted about the movement of trains whenever near a telegraph office. But, with all the instructions issued, foremen, and more especially foreign foremen, are very careless in the operation of hand cars. The one employee was killed as the result of the foreign foreman not informing himself about the movement of trains and an overdue first class train struck the hand car, throwing the man under the car.

Fifth.—The use of chisels with worn heads; handles with wind shakes, etc., was responsible for 12 per cent. of the accidents. A more rigid inspection of the tools in use by the supervisor or roadmaster would, I believe, remedy this condition. Our foremen have instructions to send a chisel to the repair shop for dressing as soon as it begins to wear. The injuries from this cause occurred in the earlier part of the safety campaign and I believe our foremen are beginning to realize that it does not pay to use defective tools.

It will require personal attention on the part of the supervisor or roadmaster, more especially with the foreign foremen who cannot understand written or typewritten instructions, to get the desired results. If we can reduce the number of injuries from one out of every 206 to one out of every 720, it will amply repay the extra effort put forth. It not only helps the head of the department, but the foremen are in shape to do better work and the company gets more efficient service.

*Received in the Safety contest which closed October 25, 1912.

A HAND DERRICK FOR LIFTING HEAVY TIMBERS.

By W. V. Parker,
Chicago, Rock Island & Pacific, Amarillo, Texas.

The hand derrick shown in the accompanying illustration has been successfully used by a bridge gang on one division of the Rock Island for the past year, and has been found to be very convenient for handling stringers, caps, floor beams and other

Small Hand Derrick for Lifting Heavy Timbers.

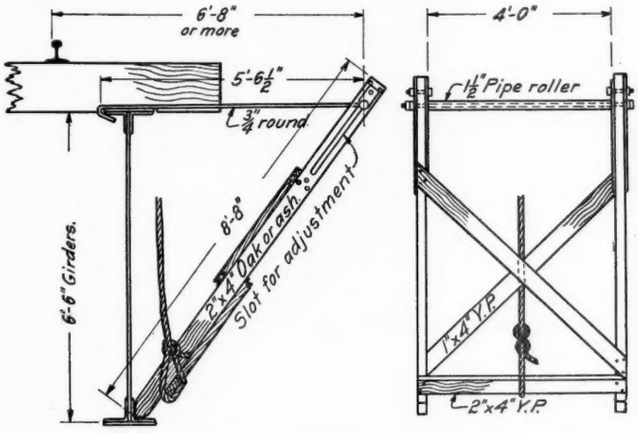
heavy members. The crab weighs 425 lbs. By using one snatch block, two men can easily raise timbers weighing 1,750 lbs. Four men are the entire force required to operate the crab while handling heavy timbers; replacing eight or ten men otherwise required. To prevent the crab from tipping, a rail clamp may be used which fastens over the ball of the rail on the side opposite the load. These clamps have not been used with this crab, however, and are not recommended, as their use prevents the moving of the crab. Rather, when necessary to counterbalance the load, old ties, guard rails, or other timbers are placed on the opposite side of the car, as shown in the photograph. The cost of this device, including labor and material is from $10 to $15.

A DEVICE FOR RENEWING TIES ON VIADUCTS.

By H. H. HARMAN,

Engineer of Bridges, Bessemer & Lake Erie, Greenville, Pa.

The device shown in the drawing has been found of much assistance when renewing ties on high viaducts, of which there are a number on our line. While the dimensions given are for the standard height of girders used on the Bessemer road, they can, of course, be changed to suit any other depth of girder. The device consists essentially of two oak timbers joined together by cross braces and by a pipe roller at the upper end which will revolve freely. Two hooks are provided, one end of which fastens over the bolt on which the roller revolves; the other end is bent to hook over the upper flange of the girder, as shown. When using this device, the lower end of the



A Frame to Assist in Renewing Ties on Viaducts.

frame is lowered into position on the outer lower flange angle of the girder by means of a rope, as shown, and the hooks are inserted over the top of the girder. When removing a tie it is forced out until the end reaches the roller, from which point it can then be very readily moved out to clear the outer rail and can either be dropped into the ravine below or be moved back on the track. A new tie is inserted in its place in the same way.

The use of this device enables ties to be put in much faster and with less danger of accident to the men than is ordinarily the case. The ties can be moved readily and the men are not required to lift out beyond the girders with the risk of falling to the ground. The device can be easily picked up and moved from place to place by two men.

NEW TRANSANDINE RAILWAY.—Engineers have now completed the plans for the new Transandine Railway the Chilean government intends to construct through the Maipo river valley, placing Santiago in direct communication with Buenos Ayres, Argentina, the journey taking only 30 hours.

THE FOREMAN PROBLEM.*

By JOHN C. PIERSON.

The men who hold the position of section foremen do not do so because they are satisfied, but usually because they are too old to start anything else. They usually have the idea that they are driven for all the work that is in them to be put aside when they can no longer stand the pace. In the first place, then, the railways should do something to overcome this feeling among the men. It is almost impossible for a man to support himself and family on the wages of the trackman. Foreigners may be able to do this, but as very few of them have the education required for a foreman, Americans must be secured to offer a supply for the foremen of the future. There is very little to induce a man to serve an apprenticeship as a laborer at $1.50 a day, with no prospects of rising higher than a section foreman at a salary of $65 to $75 per month, when he could become a brakeman earning $75 to $100 a month from the start. The brakeman's work is not as hard as that of the trackman, and a track foreman has fully as much responsibility as any conductor. The section foreman's salary should be raised high enough to attract young men to enter this branch of work.

The opinion is too prevalent that it takes no skill to be a good trackman. It requires at least four years for a man who is interested in his work to become efficient in building and maintaining track, and very few men in the average section gang have interest enough to enable them to learn it in this time. Railway companies are generally opposed to labor organizations, but these organizations set the wages that railway companies pay. Track labor is not organized, in accordance with the wishes of the company, yet in the face of the men's compliance with the company's wishes they are made to take any wages that the company sees fit. Since the welfare of the trackmen lies entirely in the hands of the company some effort should be made to make them more contented. One way of stimulating interest is by frequent meeting of the men and officers to establish close relationships. The payment of higher wages is opposed to economy, but the time is coming when the saving of money cannot enter into the question of securing foremen. The two things to consider, then, in securing efficient track foremen are (1) to endeavor to show the men that the company is interested in their welfare, and (2) to pay laborers more money, or at least place the foremen on wages which will induce young men to enter the force with that position in view.

A LOCAL SAFETY COMMITTEE.†

By F. E. CRABBS,

Roadmaster, Chicago & North Western, Chicago, Ill.

In the Chicago terminal I have organized a section foremen's safety committee composed of four yard foremen. These foremen meet at my office once every month where all reports from the division and central safety committees are read. Any accidents reported by these committees are gone over and the best ways of avoiding such occurrences on our own division are considered. After all of these matters have been discussed the committee starts on an inspection of the terminal. When the inspection is finished a report is made to me as chairman of the committee, and it is surprising what these men find that I fail to see in my daily walk over the terminal. They find the foreman of each section and talk matters over with him in a friendly way, explaining how easy it would be for a man to stumble over a rail, old tie or pile of rubbish; that the push car has been left too close to the track or a foot block is missing here and there. It is interesting to note how quickly the foreman will get busy and have the repairs made before the roadmaster comes on

*Received in the contest on The Section Foreman Problem, which closed March 25, 1912.

†Received in the contest on Safety, which closed October 25, 1912.

the ground, as he realizes that he has overlooked an unsafe condition. The committee has found places where the clearance was dangerously close, such conditions being remedied at once by moving the tracks.

We actually find that our laborers are becoming educated to the "Safety First" movement and are more careful that they do not get injured in their work. They are more watchful for their fellow employees and are doing their work better as they become more familiar with the safety plan. We have one man who inspects every switch in each yard every morning, makes any necessary repairs and renews any defective foot blocking as a matter of safety. We also have one man in each yard who goes over the entire yard twice a day picking up drawbars and car doors, or any scrap he may find. When rails, frogs, switches or ties are removed from the track they must be piled a safe distance from the track and material is removed from between tracks entirely as a safety precaution.

Every roadmaster should get into the habit of talking with his foremen and laborers along these lines, saying, for example: "As a matter of safety you should fix that joint, look after the line of that track at a certain place, see that the blocking in a certain switch is replaced, or that some obstruction is removed before and not after someone is injured."

Last, but not least, the officers higher up should be the advisers to all. The danger is growing greater and greater and the good will and advice of the officials tendered the employee in the way of safe operation will do much to reduce accidents.

SNOW ENGINEERING.

BY J. W. FOOTE,
Division Engineer, Erie, Salamanca, N. Y.

During the winter months snow is the greatest enemy to the successful operation of railways in the colder latitudes, and as such it is fought year after year. Yet, in spite of the large annual expenditure for the removal of snow and ice, no consideration seems to be given to the snow problem when new lines are constructed. Proper provision is made to prevent washouts and land slides. The drainage problem is taken care of by the construction of bridges and culverts, banks are sloped, riprap is installed, and every means is provided to prevent delays to operation. Air currents are as real and material as water currents, and in each particular location a study of them will result in determining the direction of the prevailing winter wind.

On every division the snow drifting points are known and dreaded, and it is an annual task for the maintenance officers to endeavor to maintain uninterrupted traffic from November to March. Even when the road is kept open, the cost of the removal of snow and ice and the loss due to low tonnage and slow time is enormous. With such known hazards to successful operation should it not be the policy of our railways to eliminate snow dangers during construction, instead of meeting them annually and battling with them more or less successfully?

Berm ditches are made along the upper slopes of cuts and drainage ditches at the bottom to properly carry off the water of the open season. The construction forces should also excavate ditches and throw up embankments to act as permanent snow bunkers where it is known that the track will be swept with winter winds that will surely pile the snow in huge drifts to stop or seriously delay traffic and reduce tonnage. All timber should be conserved along the property with a view of using the natural resources for the deflection of the winds and the prevention of drifts, and in some cases trees and hedges should be planted where the sweep of the wind is unobstructed. It would repay railways about to be constructed through a country subject to snow, to have a winter study made in addition to the usual location, with a view to avoiding serious snow conditions.

We are all familiar with the problem presented when a cut drifts full of snow. Preventive remedies could have been applied during construction by removing the side hill bank entirely or by conserving the timber adjoining the cut, yet in few cases are these means used. The expense of making such provisions after construction is the chief deterrent, and our railways are content to use such means as they have at hand to keep trains moving. The rotary snow plow has eliminated many of the serious delays of the past and modern methods are now in use at terminal points, yet we see the old methods of the broom and salt used by a great army of men as of old.

Reduction of unit costs at last has become recognized by a rather extravagant railway world as necessary and essential for economical operation, but nevertheless the huge army of snow fighters are engaged in the annual battle with the elements. The snow army should be reduced. In many terminals the force has been cut in two by the steam heating of switches and by the use of hydro-carbon. Hydro-carbon is particularly effective at interlocking plants, in moderate snows. Moderate snows at terminals where switching movements are frequent are as serious as severe storms are on the line. Interlocking plants are kept open by ordinary means with the greatest difficulty in a drifting storm, but a small force of men using hydro-carbon to burn out the snow can keep a plant in operation when a large force armed with brooms would be almost powerless.

Steam heating of switches is a powerful and efficient automatic snow remover, and can be used with effect in terminals where an ample steam plant is available. By its use the points are kept clear of snow and in perfect working order. The expense of installing and the removal and storage each spring is offset by the saving effected during the winter months.

Both methods are used successfully and their application should be general in busy terminals. The impracticability of their use at outlying points, however, demands that a more serious study of the prevailing winds be made and the application of the remedy to permanently deflect, as far as possible, the drift bearing winter winds. Years of battling with snow should be a strong argument for the recognition during location of the importance of making proper provision in the construction of a new railway for means to eliminate as far as possible the snow hazards now encountered.

THE FOREMAN PROBLEM.*

BY V. P. DRUGAN,
Assistant Supervisor, Baltimore & Ohio, Philadelphia, Pa.

The railways will have to make their own foremen from the material at hand, and the factors that enter into this are efficient methods in track work, organization and rewards. In standardizing methods of work, it will be found that one foreman on every supervisor's territory is able to do work of some certain kind in a better and quicker manner than the foreman of the adjoining section, while this last mentioned foreman is superior to the first foreman in some other branch of track work. Obviously, if there were a medium of exchange by which the foremen could acquire the best methods of each other, gradually eliminating the poor methods, both the foremen and the companies would be benefited. It is suggested that a supervisor's assistant could make studies and comparisons of these methods so that eventually there would be a standard method for performing each item of track work. On every section there are generally several men whose ability and industry surpass that of the others. The best one of these should be given an increase of from 20 to 25 per cent. above the others, with the title and duties of leading laborer or assistant foreman. After he has received sufficient training in this position, and as the opportunity arises through increase in force, he should be transferred

*Received in the contest on the Section Foreman Problem, which closed March 25, 1912.

to an extra gang made up of the pick of the men on the subdivision. This gang would form an admirable nucleus for expansion during the busy seasons, and this increase would offer ample opportunity to study the ability of the men in handling others, as the foreman would have to depend upon them to a large extent in handling the large force of green men. At the time of force reduction, the former green men should be culled over, and the good ones distributed to various sections.

The matter of rewards can be handled by the railways by a more liberal policy toward the men in the way of passes. A man who has qualified for the extra gang should be given a card pass good over his sub-division, and when he becomes a foreman a pass for himself and family would go a long way towards insuring a satisfied, contented man.

The operation of this method would increase the rating of that portion of the extra gang under observation for foremen and would add to the cost of supervision. An economic study, however, will show that the results of the studies of the assistant supervisors will eventually make for a saving of labor and an increase in efficiency more than sufficient to justify this increased cost.

ANNUAL CONVENTION OF THE AMERICAN RAILWAY ENGINEERING ASSOCIATION.

The "stated meeting" of the Railway Signal Association will be held at the Congress hotel, Chicago, March 17, while the fourteenth annual convention of the American Railway Engineering Association will be held at the same place on March 18-21, inclusive. The various committees of the Railway Signal Association will present progress reports at the meeting on the first day, while on the three following days, 19 regular and two special committees will present reports to the latter association. A new feature of the convention of the Engineering Association will be a reception by the president and officers in the Gold room of the hotel to the members and guests. The annual banquet will be held on Wednesday evening. Another new feature this year is the extending of the convention to cover four days. The regular sessions will conclude on Thursday afternoon as formerly, and Friday will be devoted to the inspection of the exhibits of the Railway Appliances Association.

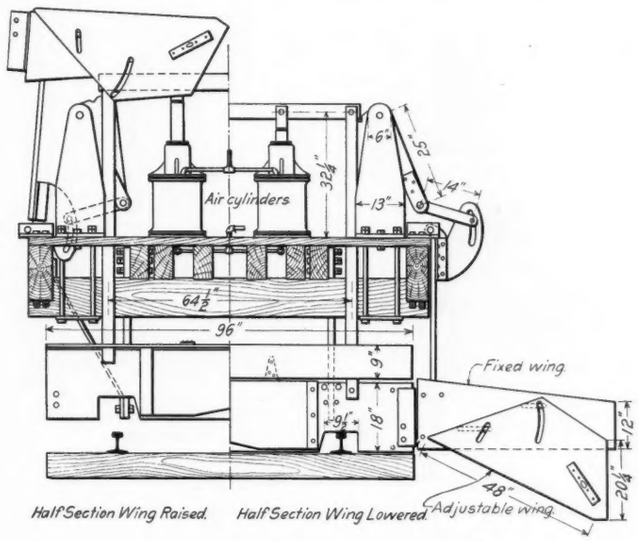
The annual exhibit of road, track and signal appliances in connection with this convention will be held at the Coliseum and the Armory during the entire week beginning Saturday, March 15. From the large number of reservations for space made to date, it is expected that this exhibit will exceed that of any previous year, both in number of exhibitors represented and in space occupied.

THE CAFFERTY-MARKLE BALLAST SPREADER.

A new spreader for distributing ballast was used at various points on the eastern lines of the Atchison, Topeka & Santa Fe last summer with satisfactory results. It is designed to follow an ordinary ballast plow to remove the larger portion of the material remaining between the rails, to throw the ballast off the ends of the ties outside of the rail and to shape the shoulder. The spreader is built on a flat car, carrying an ordinary ballast plow.

The middle portion extends down between the rails almost to the top of the ties with two independent wings over the ends of the ties. It is operated by air from two vertical cylinders placed on the platform of the car, which are directly connected to the train line. When in use the central portion is held in place by vertical rods extending through the cross beam of the car body to heavy timbers supporting the floor. When out of service it is raised vertically clear of the rails by the air cylinders. The side wings are operated separately from the center board and are adjustable vertically and horizontally. When not in use they are revolved about bell cranks on the platform and fold back over the air cylinders. When working on double track, the inner wing can be replaced with a longer one to level off the material between the tracks.

This spreader has been used in both stone and gravel ballast,



Half Sections of the Cafferty-Markle Spreader.

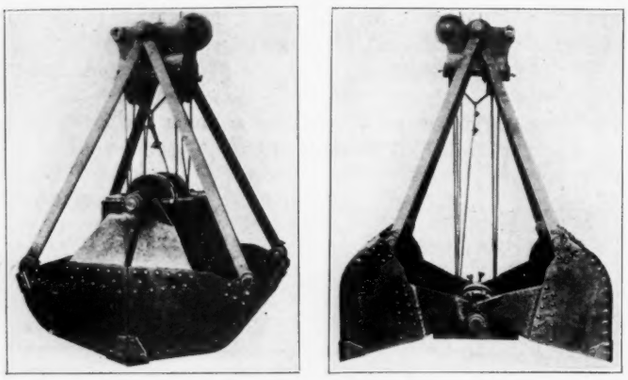
and it is said that it removes more than 80 per cent. of the material from between the rails and off the ends of the ties. The actual saving in the handling of ballast is estimated at from 15 to 25 per cent., depending on local conditions. The records which have been kept for comparative purposes so far, indicate that

The Spreader Working In Stone Ballast.

this saving per mile of single track ballasted may reach as high as $65. This spreader has been developed and patented by J. F. Markle, Chanute, Kan., and T. S. Cafferty, Union, N. Y.

A NEW STYLE BUCKET.

A new style bucket has recently been brought out for use in extra heavy digging, such as iron ore, slag, rock, clay, etc. This bucket has been constructed with a view to low maintenance cost. The shells consist of plates fastened together with angles. The sheaves are placed at right angles with the top and bottom castings, thereby forming a housing which prevents the rope from



Closed. Open.

New Browning Bucket.

running off. The cable is reeved so that the load is on the center sheave in preference to the outer ones. The large main bearings are of steel with bronze bushings. This bucket is made in the ordinary sizes and is manufactured by the Browning Engineering Co., Cleveland, O.

NOTES ON ANALYSIS AND TESTING OF COAL TAR CREOSOTE.*

BY L. B. SHIPLEY,
Barrett Manufacturing Co.

This paper deals with three subjects which are under investigation in the research laboratories of the Barrett Manufacturing Company: Distillation tests of oils, comparative volatility of oils and extraction of oils from treated wood. The distillation tests compare the three methods which embrace the various types of distillation: American Railway Engineering Association retort methods, described in Bulletin 65 of the association; National Electric Light Association, report of committee on Preservative Treatment of Poles and Crossarms, 1911; and Forest Service of the Department of Agriculture, described by Dean & Bateman, circular 112, "Analysis and Grading of Creosotes." The retort method and that of the N. E. L. A. give approximately the same results, while the Forest Service method gives considerably more distillate at 200 deg., 210 deg. and 235 deg. than do the others, a result which might be expected.

S. R. Church, in the Proceedings of 1912, page 117, described a series of tests to determine the relation that exists between the evaporation of an oil and its distillation range. These tests have shown that the relative evaporative loss from an open dish and from treated wood is comparable. The next logical step, and one which we are now arranging to carry out, is to make use of an experimental cylinder for a similar series of tests, and thus closely approximate conditions which are met in practice.

Through the courtesy of the United States Wood Preserving Company, Norfolk, Va., one-foot sections of a pile were treated in an experimental cylinder during April, 1912, and in November, 1912, six months after treatment, during which time the sections were exposed to laboratory conditions in gunny sacks; they were quartered, and alternate quarters reduced to fine sawdust by means of a circular rip-saw. The oil was extracted with benzol in an extraction apparatus and the benzol then removed by distillation up to 210 deg. C., with the thermometer bulb in the liquid. Six different oils were used in these tests, two coal tar creosotes, two oil tar distillates, one of 50 per cent. coal tar creosote and 50 per cent. oil tar distillate, and one paving oil. The writer would draw from the results of these tests the following conclusions: The specific gravities are increased by evaporation in all cases except the paving oil. The tar acids do not appear to have evaporated any faster than the other portions of the oil. The extraction of an oil apparently gives a fair index of its original character.

*Abstract of a paper read before the ninth annual convention of the American Wood Preservers' Association, held at Chicago, January 21-23, 1913.

SINKING GOLD IN WATERWAYS.

Tens of millions of dollars have been wasted in appropriations made by Congress for the development of impracticable river and harbor projects; here a little and there a little for the political benefit of grafting Congressmen. On the two hundred miles of the Mississippi river between the Missouri and the mouth of the Ohio we have spent $15,000,000. Yet the traffic on this part of the river, including that of St. Louis, has steadily decreased, and in 1911 it fell to 191,965 tons. The United States has spent more in improving this stretch of the Mississippi river—200 miles—than the Central Government of Germany has spent for improving the Rhine from Strasburg to the frontier of Holland, about 355 miles, on which the annual traffic reaches the enormous aggregate of 40,000,000 tons. In Germany, France and Belgium the waterways are improved for the benefit of the people and the development of commerce. In the opinion of Senator Burton "we should not consider our rivers merely as weapons with which to hold the railroads in subjection." In the general River and Harbor Bill of 1910, which called for $52,000,000, 296 out of the 391 Congressional Districts in the United States received appropriations for this purpose. The Big Sandy river and its tributaries have cost the taxpayers $1,700,000, and "the annual traffic on these streams, exclusive of timber, amounts to 2,000 tons." "In interest alone on its investment, it costs the United States $20 for every ton of freight carried on these streams. Added to this is the annual cost of maintenance of $20,000, or $10 for every ton of traffic." The improvement of the Big Sandy was undertaken to furnish cheap transportation of coal. Last year not a single ton of coal was carried on the Big Sandy system. The Hennepin Canal, Trinity River in Texas, and the Muskingum River in Ohio, are similar examples. The Missouri River between Kansas City and the Mississippi has cost the taxpayers $11,500,000. In 1910 the traffic over this stretch of navigable water aggregated about as much as two ordinary freight cars would hold.

France has expended $450,000,000 on its waterways; the River Seine carries annually about 10,000,000 tons of freight between Paris and the ports of Rouen and Havre. The United States has expended $600,000,000 in river and harbor improvements, the most of which has been thrown away. In France the government requires the railroads to charge twenty per cent. higher freight rates than the waterways, and in Belgium and Germany competition between the railroads and the waterways is regulated and controlled through government ownership of the railroads. So long as the railroads in this country are suffered to put up or put down their rates accordingly as the waterways are effective or not it is not possible that, however the waterways may be improved, they will be able to serve the alleged purposes for which they have been improved. The Interstate Commerce Commission should have the power to fix both maximum and minimum rates on all interstate water and rail transportation; the waterways should be granted terminal facilities, should issue through bills of lading, and the railroads should be required to co-operate with the waterways so that the boat lines may assume their natural position as supplemental means of transportation to our rail lines.—*New York Times.*

General News.

The Wabash Pittsburgh Terminal & West Side Belt Railroad has established a "Safety Committee," which will act in conjunction with the safety committee of the Wheeling & Lake Erie.

The man who, single handed, robbed ticket offices in daylight in New York, Buffalo, Cleveland, Pittsburgh and Philadelphia, was caught at Boston and has been sentenced to from six to ten years in the Massachusetts state's prison.

The Southern Pacific lines in Louisiana have organized a police force in charge of J. S. Webster, who has been appointed general special agent. Heretofore this service has been handled for the company by a private detective bureau under contract.

The Atchison, Topeka & Santa Fe was fined $200, and the Baltimore & Ohio $1,100 in the federal district court at Chicago on February 12, for violation of the federal hours of service law, and the Chicago & North Western was fined $200 for violation of the safety appliance law.

The Kansas Senate has adopted a resolution instructing the state public utilities commission to investigate the $100,000,000 bond issue of 1901 of the Union Pacific, and to take such action as in its judgment "may be deemed proper for the protection of the interests of the people of the state."

The general manager of the Pennsylvania Railroad has issued a circular calling attention to the necessity of special care on the part of track foremen in watching laborers who while at work on the track wear ear mufflers. With mufflers on the ears a man may not quickly hear an approaching train.

Port Nelson has been selected as the place for the northern terminus of the Hudson Bay Railway. This announcement was made by the Canadian Government at Winnipeg last week. Churchill, the rival location, has a better harbor, but Port Nelson is held to be ideal for a town site railroad terminus.

The Chicago & Alton has refused the demand of unions representing its employees at the Bloomington shops, that the working time in the shops be placed on a basis of eight hours a day, and five days a week instead of six days a week, in order that the full force may have an opportunity to obtain employment.

About 250 employees of the Lehigh Valley at Buffalo, N. Y., struck last Wednesday in response to a strike order, which, it is said, has been sent to all members of the International Association of Car Workers on the Lehigh Valley, about 2,000 men. The strikers demand shorter hours and a 20 per cent. increase in pay.

The governor of Massachusetts, in furtherance of his proposal to have a New England "railroad conference," has appointed for that purpose on behalf of Massachusetts Hon. M. P. Knowlton, of Springfield, former chief justice of the Supreme Court, and Rear Admiral F. T. Bowles, of Boston, late chief constructor of the navy.

The new "Overland Limited" express of the Chicago & North Western, announced last year, will be put in service April 1. The train will run between Chicago and San Francisco in 64 hours, and the extra fare will be $10. On the same date the new train of the Chicago, Milwaukee & St. Paul will be put on, running through in 72 hours.

The telegraphers of the Southern Railway have secured an increase in pay, said to be about 8 per cent. This announcement was made following a series of conferences said to have been facilitated by Judge Knapp, of the Commerce Court, and the acting commission of labor, G. W. W. Hangar, acting as a board of mediation under the Erdman law. The number of employees affected is said to be about 2,000.

On Thursday of last week the Delaware, Lackawanna & Western moved from Slateford Junction to Port Morris, a coal train said to be more than a mile long. The distance between these places, over the new cut-off line, is about 30 miles. The train consisted of 132 cars of coal, with three engines at the head and two at the rear. It is said that the train made "average freight speed," but the reporter very candidly adds that "the immense pull of the engines at the front of the train caused several couplings to break."

At Bridgeport, Conn., on Tuesday last, L. J. Carmalt, engineer of Maintenance of Way of the New York, New Haven & Hartford, was arrested on a charge of manslaughter, in connection with the derailment at Westport, October 3. He was released on $5,000 bail. The state's attorney proposes to have Mr. Carmalt tried with Messrs. Horn, Pollock and Woodward, who were indicted about two months ago on the same charge.

The Bangor & Aroostook announced on Monday of this week that freight would be accepted for all points on the line. Since the strike of enginemen freight had been accepted only in carload lots. President Todd, in a published statement, named various attempts to delay or wreck trains, and announced that until the authorities put a stop to outrages the early morning and late afternoon passenger trains would not be restored; neither would freight trains be run at night. The strikers denied knowledge of anything connected with the outrages and said that none of the men who had left the road were allowed to go on the property of the company except as paying passengers.

The feeling, always prevalent in legislative bodies, that a state commission can do anything that it sets out to do, has received a recent illustration in the action of the lower house of the New York legislature, at Albany, which has adopted a resolution calling on the public service commission for an inventory and appraisal of the property of the New York Telephone Company. Chairman Stevens, replying to the resolution, says that to do the work with his present force would take 28 years. If the work must be done sooner, a little appropriation of $270,000 will be needed. The Telephone company has 364 exchanges in 49 different counties of the state, together with hundreds of pay stations in towns and villages where there are no exchanges.

The Interstate Commerce Commission has published the annual report of the District Electric Railway Commission, a body which, under the direction of the Interstate Commerce Commission, regulates in certain features the operations of street railways in the District of Columbia. The chairman of this district commission is John H. Marble, secretary of the Interstate Commerce Commission. The district commission has held 37 executive sessions and eight public sessions during the year, and has received 106 complaints. These complaints deal with the usual variety of subjects well known to everybody interested in street railway regulation. The orders of the district body have to be confirmed by the national body. These orders have to do with such things as changing the time interval between street cars from 1¾ minutes to 1⅔ minutes. Forty-three orders were issued during the year.

Judge Mayer, in the United States District Court at New York City, February 15, authorized the appointment of a commission to go to London to take testimony concerning the action of the directors of the Grand Trunk in relation to the stoppage of work on the company's extension from Palmer to Providence, R. I. In the superior court at Concord, N. H., February 15, the Grand Trunk Railway Company filed a bill to test the legality of the Southern New England Railway Company, which was organized to build a line from White River Junction, Vt., southeastward toward Boston. The bill says that the signature of the Grand Trunk by the late Charles M. Hays, its president, is not binding on the G. T. company, but was Hays' unauthorized act. He did not have the power to bind the company to the purchase of shares of the capital stock of the proposed New Hampshire company. It is further alleged that the route set forth in the articles of agreement does not describe a route within the meaning or contemplation of the statutes.

The plans of the railways for the location of the proposed Union station in Chicago have encountered the opposition of the Chicago plan commission. A conference was held on Monday last between J. J. Turner, vice-president of the Pennsylvania Lines West, Darius Miller, president of the Chicago, Burlington & Quincy, A. J. Earling, president of the Chicago, Milwaukee & St. Paul, and B. A. Worthington, president of the Chicago & Alton, and members of the commission. The railways have selected a site for the proposed station between Adams, Jackson, Clinton and Canal streets, as described in the *Railway Age Gazette* of August 23, 1912, page 354, while the plan commission's scheme provides for the location of all new railway passenger stations south of Twelfth street. The commission's plan has been investigated by the roads for several

years, and has been rejected as impracticable. While they have practically completed plans for building on the site between Adams and Jackson streets, the plan commission declined to approve the plan of the railways, but decided to appoint a committee of five to consider the question further, and to endeavor to reconcile the two plans.

From the Chicago Inter-Ocean, December 31, 1862.

George M. Pullman, of the firm of Pullman & Moore, house raisers, is experimenting with what he calls a "palace sleeping car." The wise ones predict it will be a failure.

Fatal Accidents in New York City.

Not all of the dangerous places in the world are to be found on the railroads, although, at times, one reading American newspapers might get the impression that such was the fact. No less than 2,712 violent deaths occurred in New York City during the calender year 1912, as reported by the board of Coroners; and railroad men will be interested in some of the details of this statement, showing the causes of the deaths. Railroads seem to be much more careful of people's lives than are the people themselves. Four hundred seventy-four of these deaths were suicides; and of the other causes in the list, some of the most prominent are the following:

Accidental falls and falling articles	726	Overlying	32
Accidental burns	267	Choked by food	15
Submersion	229	In subways (none in train accidents)	14
Accidentally overcome by gas	183	Explosions	14
Homicides by shooting	114	Machinery accidents	11
Automobiles	146	Kicked by horse	10
Horse drawn vehicles	108	Electric shocks	5
Surface street cars, electric	62	Accidental cutting	4
Surface street cars, horse drawn	10	On N. Y. C. & H. R. R. R.	3
Elevators	53	Accidental shooting	3
Accidental poison	52		

The number of persons killed in automobile accidents, 146, is 55 more than in the preceding year. Of the accidental falls, 97 were falls from windows, and of the 97 victims 36 were under 14 years of age. Of the 5,697 deaths reported to the coroner's office during the year, 149 were of persons never identified, and of these unidentified 64 were children.

Unfilled Tonnage of the Steel Corporation.

The report of the United States Steel Corporation shows that on January 31, 1913, the unfilled tonnage was 7,827,368 tons, compared with 7,932,164 tons on December 31, 1912, a decrease of 104,796 tons. The unfilled tonnage on November 30, 1912, was 7,852,883 tons; October 31, 1912, 7,594,381 tons; September 30, 1912, 6,551,507 tons; and January 31, 1912, 5,379,721 tons. The decrease shown last month was the first since March, 1912. The showing did not come as a surprise, for shipments during January were heavy, and it was generally known that the volume of orders was decreasing. This was partly due to the congested condition at the mills, making it impossible for them to accept new orders for early delivery.

Congestion on a Section of the Panama Railroad.

While the building of the Panama Canal has often been characterized as largely a railway traffic problem and railway men in this country have grown used to the reports from the Isthmus of exceedingly busy stretches of track, the changes in the operation of the main line of the Panama Railroad to be made on account of the removal of the construction tracks from the site of the Miraflores spillway will set a record for dense traffic on the Isthmus. The dirt trains from the south end of the Culebra cut have been crossing the site of the spillway to reach the dumps at Miraflores; but the excavation for the spillway has now so far progressed that it will be necessary to remove these tracks by the first of March. After considering the possibility of raising the tracks on bridges over the spillway this plan was abandoned and it was decided to send the dirt trains over the main line of the Panama Railroad through the tunnel at Miraflores. This tunnel is single track and in the 10 hours between 7 a. m. at 5 p. m. will be used by 6 regular passengers and 10 regular freight trains of the Panama Railroad; and during this time 80 dirt trains pass out of the south end of the cut and return into it. Approximately 175 trains will use the 1,050 ft. section of single track in 10 hours, which is at a rate of one every 3 minutes 26 seconds. A train 940 ft. long traveling at 10 miles an hour will require about 2 minutes and 20 seconds to traverse and clear the single track section, and successive trains will not be able to follow each other faster than one a minute. An interlocking plant will be built to work the switches at both ends of the tunnel.

"Safety First" on the Canadian Pacific.

The Canadian Pacific has ordered the establishment of safety committees throughout the company's lines. A sheet filled with mottoes of the "safety first" propaganda has already been prepared, in which points that have already been emphasized in the work of numerous safety committees are brought out in a new light by being written in the first person; for example:

I will not stand in front of a moving car, or engine, to board same.

I will always respect the blue flag, because the lives of my fellow-employees depend upon it.

I will not stand between the cab and the apron when coaling an engine.

I will not push a drawbar with my foot, or hands, when cars are moving, or when they are close together.

I will turn down boards with nails sticking out of same.

I will not adjust a coupler, turn an angle cock, or uncouple hose when cars are in motion.

I will not hold on to the side of a car when passing platforms, buildings, or obstructions close to the track.

I will not use 2 in. nails in building a scaffold where 4 in. nails would be safer.

I will not shove cars into a freight shed, or on team tracks, without first making sure that all men and teams are clear.

I will do all I can to stop the loss of life and lessen the injuries to my fellow-employees.

I will not kick cars into sidings, where boarding cars, or cars being loaded, or unloaded, are standing.

I will remember that it is better to let a train wait than to cause an accident.

I WILL NOT TAKE CHANCES.

I believe that Safety First is simply a habit and I will cultivate the habit.

The prevention of accidents is a duty I owe myself, my family, and my fellow-employees.

I believe that some accidents are not inevitable and I know the great majority of them can be prevented by care.

I will take out immediately sufficient accident and life insurance to protect myself and those dependent upon me.

Railway Etiquette.*

Middle Jersey is one broad grin because of the new rule of etiquette issued by the Pennsylvania Railroad for the guidance of trainmen on the division having its headquarters at Camden. It will be recalled that Camden was long the home of Walt Whitman, and that one of his intimates in those days was a plain young railway worker. . . . The fiat has gone forth that no employee shall address a passenger as "friend," "stranger," "comrade," "brother," "sister," "neighbor," or by "any other term of this character," such, one is permitted to conjecture, as "pard." or "countess." The conversation of the railway employee with the patron of the road shall be yea, yea and nay, nay, or the equivalent; which, according to the official prescription, is to be "Sir," "Madam," or "Beg pardon."

No doubt these regulations will be obeyed with promptness and precision on through express trains; but there are a good many way trains running out of Camden; and Central Jersey, like Cape Cod, is as easy in manners as an old shoe. The first time Brakeman Bill Thompson says "Beg pardon" to his neighbor, Mrs. Sinnexson she will laugh in his face, and the book of etiquette will never again come between the pair. When the grizzled conductor whom everybody between Camden and Bridgeton has known for a lifetime, sits down a moment to rally some young woman from a way station about her new beau, like as not he will forget the book of etiquette, and call her "Sister Jennie"; and in all probability he will so far transgress the proprieties as to salute the benevolent, spectacled old gentleman from Vineland, with the easy and familiar "Hello, Doc!" Should the New England lines suddenly catch the Pennsylvania's notion of railway etiquette, journeys hereabouts would lose a good deal of their fine native flavor. It would be a pity were those amiable Cape conductors forbidden to pass a friendly word with the strange passenger whose receptive air seems to invite confidence and the jocular word.

*From numerous newspaper expressions on this absorbingly interesting topic we select that of the *Boston Transcript*.—Editor.

W. J. Lampton, of New York, sends to the *Tribune* a half dozen verses, of which we copy four:

No more we'll hear the pleasant cheer
At all the wayside stops
Of brakemen or conductors kind:
"Well, neighbor, how's the crops?"

No more the word we oft have heard
Of "Partner, how d'y' do?"
And never shall we hear again:
"Say, friend, you're looking blue."

No more today, the good old way;
The ruling now forbids,
And kindly trainmen may not ask:
"Well, sister, how's the kids?"

"Beg pardon," "Sir," or "Madam," now
The fetters of the free,
Makes travel on the P. R. R.
A cold formality.

Freight Traffic Across the Isthmuses.

The Bureau of Foreign and Domestic Commerce, Washington, has published a statement to the effect that the value of the freight carried across the isthmuses of Panama and Tehuantepec, eastbound and westbound, in the year 1912, amounted to $125,000,000. This is an estimate, based on statistics for five months ending with November, during which time the merchandise carried from the Atlantic to the Pacific over the Tehuantepec Railroad was 24½ millions; from the Pacific to the Atlantic 14⅓ millions; from the Atlantic to the Pacific over the Panama Railroad, five millions, and from the Pacific to the Atlantic over the Panama line, 3¾ millions.

For a few of the principal commodities the quantities for the five months are given, as follows:

EASTBOUND.

	Panama.	Tehuantepec.
Barley, bushels	174,914	62,088
Fish, canned, tons	3,156	5,634
Fruit, tons	3,303	2,614
Sugar, tons	....	100,963
Wines, tons	1,424	1,863
Wool, tons	834	3,385

WESTBOUND.

	Panama.	Tehuantepec.
Iron and steel, tons	12,327	14,732
Printing paper, tons	302	587
Starch, tons	292	727
Tobacco, tons	16	604

Firemen's Wages.

The eastern railroads and the committee of their firemen have agreed to arbitrate the firemen's demands under the Erdman act. This decision followed the sending of a letter by the railroads' committee, on Tuesday last, to the government conciliators, which letter is printed below. Following the announcement that an agreement had been reached, Judge Knapp said that the firemen's committee had voted to join the other classes of employees and the officers of the railroads in asking Congress to modify the Erdman act. The railroads have selected W. W. Atterbury, vice-president of the Pennsylvania Railroad, as their member on the board of three arbitrators, and the firemen's committee has named Albert Phillips, third vice-president of the firemen's brotherhood. Mr. Phillips was born in California and began his railway service as a fireman on the Sacramento division of the Southern Pacific fifteen years ago. He was made an engineman in 1903. For the last three years he has devoted his time entirely to his position as an officer of the brotherhood.

In the course of the negotiations last week, Mr. Carter, chief of the firemen, was quoted as charging that the railroads desired to force the men to strike. for the purpose of teaching the American people that freight rates must be increased; or to secure a compulsory arbitration law; or, thirdly, to scare President-elect Woodrow Wilson by celebrating his inauguration with the biggest strike that the country has ever had. Compulsory arbitration, said Mr. Lee, would provide for a commisison which could raise wages 10 cents and then raise freight rates 20 cents, after the fashion of the acts of the coal strike commission.

Mr. Carter said the increase in pay asked for by the firemen would be only 15 per cent.; it would not be so large as had been claimed by the railroad argument. He said that they were only asking the same rates that were granted to the firemen of the western railroads in 1910. His reasons for objecting to an arbitration arranged voluntarily and not under the Erdman law were set forth as follows:

1. Awards are based on false evidence prepared by the railroads and considered by the arbitration board after hearings have been closed.

2. Testimony and documentary evidence are introduced and considered without witnesses being placed under oath, and with no legal means of penalizing witnesses for false testimony.

3. Awards are not based on testimony and evidence submitted, but on information secured by individual members of the board.

4. No opportunity is given to controvert false testimony considered by the board after hearings are closed.

Mr. Carter's charge of falsity in the records evidently is based on the statement made in the dissenting opinion of Mr. Morrissey in the engineers' arbitration.

Mr. Lee, chairman of the committee of railroad managers, replying to published statements of Mr. Carter, said that the firemen were making excessive demands because they hoped to show that they could get more out of the employers than could the engineers' brotherhood. There is keen rivalry between the two brotherhoods for membership of the engineers. The demand for two firemen on heavy engines will soon expand into a demand for two on all engines. As to false testimony, there was not a particle of testimony introduced by the railroads in the engineers' arbitration that would not have been introduced had sworn testimony been taken. The managers prefer to swear to their testimony, but past experience has shown that such procedure does not deter representatives of the Union from resorting to all kinds of sharp practice.

Letter of Railroads' Committee to Government Conciliators.

At the urgent request of you as representatives of the government, and under the strongest protest we are able to voice, the managers' committee agree to arbitrate the firemen's controversy under the Erdman act. The managers also desire to give notice at this time that they shall earnestly request that the hearings in this arbitration be open to the public.

As the managers have stood out to the limit against arbitration under the Erdman act, and as the government—or the public—is responsible for whatever the consequences may be, the managers reiterate their principal objections to the Erdman act; these were pointed out by the board of arbitration in the engineers' case:

"The responsibility which ultimately would rest upon a third member of an Erdman arbitration board was too great to impose on any one man.

"The operation of the act is to settle a dispute rather than to adjudicate a controversy.

"The arbitrators are three in number. Each side is represented by one arbitrator. It rests therefore upon the third arbitrator to bring the other two arbitrators as nearly as possible together, and if he cannot do so, he must decide between them. This is accomplished by splitting differences, and the case may be adjusted without adequate investigation of the facts involved, and the award may not rest upon a basis of equity.

"But the most fundamental defect of the Erdman act is that the interests of the public are not guarded by it."

The managers feel that the public will not tolerate a strike, and realizing their three-fold responsibility to the public, their men, and their shareholders, they only agreed to arbitration under the Erdman act when it seemed the only way to avert the calamity of a strike.

The firemen's brotherhood has no responsibility except to its members.

The question the public should seriously consider is whether, in compelling the railroads to arbitrate under a defective and inadequate law, and in thus securing temporary convenience and accommodation, they are not sacrificing their permanent welfare.

The managers' committee wishes to warn the public at this time of another and similar demand for increased wages made by the conductors and trainmen. We desire to put the public on notice as to the crisis that will confront them when these demands are considered by the railroads.

We also desire to call attention to the serious public danger of these recurring demands, backed up by repeated demands that the railroads arbitrate "under the law."

The whole situation is now in the hands of the government

and the people. They have taken it out of the hands of the managers at a time when the latter hoped to make a stand for the public good.

Proposed Physical Valuation of Railways.

The Senate committee on interstate commerce at its hearings in Washington last week on the bill, H. R. 22593, providing for a valuation by the Interstate Commerce Commission, listened to Professor John R. Commons, of the University of Wisconsin; E. W. Bemis, of Chicago; President F. A. Delano, of the Wabash; Chairman Frank Trumbull, of the Chesapeake & Ohio and the Missouri, Kansas & Texas; and L. F. Loree, president of the Delaware & Hudson. Mr. Trumbull explained in detail a number of changes in the phraseology of the bill which the railroads desire to have made. Mr. Loree pointed out the wide disparity in prevailing methods of making valuations of railroad property, as set forth in a report presented to the National Association of Railway Commissioners at Washington last November. Actual instances are shown where engineers of equal competency differ 100 per cent. in their estimates of the value of certain properties. In view of the difficulty of the task and of the fact that the Interstate Commerce Commission is already overworked, Mr. Loree proposed that the bill now pending be amended to include the following: "To enable the commission to make such investigation and report it is authorized and directed to constitute and employ a Railway Valuation Board to consist of nine members, three of whom shall be selected by the Interstate Commerce Commission, three shall be nominated to the commission by the American Railway Association, and one each to be nominated to the commission by the Chief Engineer of the United States Army, by the Chief of the Bureau of Steam Engineering of the United States Navy, and by the president of the American Society of Civil Engineers." The Senate committee on February 17 voted to report the bill favorably.

Proposed Legislation.

Both houses of the Oklahoma legislature have passed a full crew bill. It requires all freight trains to be manned with a fireman, engineer and three brakemen.

Assemblyman Jones has introduced in the legislature of New York a bill to provide for reciprocal demurrage, and to compel railroads to carry freight and deliver it on time.

A bill has been introduced in the Iowa legislature requiring that all railway locomotives be equipped with headlights of not less than 1,500 c. p., measured without the aid of a reflector.

A bill has been introduced in the legislature of Indiana to require the engines of a double-header train always to be kept together; this to prevent the second engineman from being blinded by the smoke of the leading engine.

A bill providing for an extra brakeman on all passenger trains of six coaches or more, and on all freight trains of 25 cars or more, has been defeated in the lower house of the Texas legislature.

A bill has been introduced in the Texas legislature which designates the state railroad commission as a board of arbitration, with power to settle disputes between the railways and their employees regarding wages or conditions of service.

The Farmers' Union of Texas sent to all the members of the legislature a protest against the passage of any full-crew bill. They asked that no additional burden be placed on the producers of the state. The memorial said: "We are opposed to the bill now pending that will compel the railroads to employ additional men on their trains, thereby increasing the cost of operation about $1,000,000 a year. We believe that this increased expense is unnecessary and unjustified, and we know that every increased expense of operating the railroads is borne by the farmers and producers."

A bill to require all cabooses to be 24 ft. long has been introduced in the New York legislature. The bill goes into minute particulars, specifying the number and length of the berths to be provided for the men to sleep in. After July, 1920, it will be unlawful to use a caboose not complying with the statute.

A bill has been introduced in the Illinois legislature providing for the formation of a state board of control, composed of the railroad and warehouse commissioners, the governor, the attorney general, the secretary of state, the state auditor, and the state treasurer, to have mandatory jurisdiction over security issues of all railways operating in the state.

In the Senate of the Indiana legislature, three railroad bills have been voted down; one to require the interurban roads to have a fixed signal at small stations by which passengers could stop a car; one to prevent the overloading of street cars and one requiring locomotives to be so designed that the fireman and the engineman may at all times easily see each other. This last proposition is not dead, however, and it is expected that another bill will be introduced.

The legislature of Indiana has before it a bill to require the railroads of the state to pay their employees twice a month. P. S. Ahrens, treasurer of the Lake Shore & Michigan Southern, opposing the passage of the bill, told the Senate committee that he believed a majority of the employees did not care for it. He had been informed that in New York State most of the employees are more than willing to go back to monthly payments. Many employees do not draw their wages for the first two weeks of the month but let the money rest in the paymaster's office until the end of the month. A bill for a similar purpose has been introduced in Kansas.

Senator Crawford, of South Dakota, has introduced in Congress a bill providing that federal courts shall enjoin the enforcement of state laws only under severe restrictions. It provides that no interlocutory order or decree of a federal court to enjoin the enforcement of a state law or any order by an administrative body, pursuant to state law, shall be granted except under conditions specifically stated. No injunction could be granted by any United States court until the application has been presented to a Justice of the Supreme Court or to a Circuit or District Judge, and then only after having been considered by three Judges sitting together, one of whom must be a Justice of the Supreme Court, a majority determining the question presented. No injunction can issue except upon ten days' notice; but if it is shown that irreparable loss may ensue, a temporary restraining injunction may be issued for no longer than ten days, and may be dissolved upon a proper showing by the other side. Senator Crawford aims to thwart the railroads in their litigation to prevent the enforcement of two-cent fare laws in certain states.

Sixty-six bills affecting railways have been introduced in the Colorado legislature, including a full crew bill, a headlight bill, a bill requiring the installation of automatic block signals, and a bill repealing the anti-scalping law and making railway tickets subject to assignment and sale by the holder. At a meeting last week of committees representing the Denver Chamber of Commerce, the State Retail Dealers' Association, the Denver Real Estate Exchange, the Colorado Manufacturers' Association, and the Colorado Publicity League, called to consider bills before the legislature, officers of the railways presented arguments against many of the bills, and stated that if they were passed the people could expect little progress from the railways. A telegram from E. E. MacLeod, chairman of the Western Passenger Association, stated that if the railway ticket bill were passed it would naturally mean an advance in passenger fares to Colorado, and that at a recent meeting of western lines to consider summer tourist fares to Colorado for the season of 1913, action on the subject was postponed and the proposed rates to Colorado were held up pending advice of the final outcome. Telegrams were also received from Newman Erb, president of the Denver & Salt Lake, and Darius Miller, president of the Chicago, Burlington & Quincy, expressing the hope that the legislature would see fit not to enact laws disturbing or curtailing development.

Railway Business Association.

The members of the executive committee and the advisory committee of the Railway Business Association are as follows: Executive committee, E. L. Adreon, St. Louis, Mo.; J. C. Bradley, Buffalo, N. Y.; J. S. Coffin, New York; Walter H. Cottingham, Cleveland, Ohio; O. H. Cutler, New York; William C. Dodd, Newark, N. J.; Henry Elliot, East St. Louis; Irving T. Hartz, Chicago; F. T. Heffelfinger, Minneapolis, Minn.; W. B. Leach, Boston, Mass.; E. B. Leigh, Chicago; W. H. Marshall, New York; William McConway, Pittsburgh, Pa.; W. H. Miner, Chicago; A. H. Mulliken, Chicago; Rudolph Ortmann, Chicago; W. W. Salmon, Rochester, N. Y.; J. H. Schwacke, Philadelphia;

James S. Stevenson, Detroit, Mich.; H. H. Westinghouse, New York, and W. W. Willits, Chicago; advisory committee, J. S. Coffin, O. H. Cutler, Irving T. Hartz, E. B. Leigh, W. H. Marshall, A. H. Mulliken, H. H. Westinghouse, W. W. Willits and the president and vice-president.

New York Railroad Club.

The next regular meeting of the New York Railroad Club will be held February 21, and will be devoted to further promotion of the Safety First campaign. A paper will be presented by J. W. Coon, of Baltimore, assistant to the general manager of the Baltimore & Ohio and chairman of the general safety committee of that road. It will be supplemented by lantern slide illustrations by C. W. Egan, general claim agent of the Baltimore & Ohio. This will be followed by a discussion.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers, held February 19, two papers were presented for discussion as follows: A Suggested Improvement in Building Water-Bound Macadam Roads, by J. L. Meem, Assoc. M. Am. Soc. C. E.; and Long-Time Tests of Portland Cement, by I. Hiroi, M. Am. Soc. C. E. These papers were printed in the *Proceedings* for December, 1912.

American Institute of Consulting Engineers.

A meeting of the institute for the purpose of further discussing "Professional Relations," will be held at the Engineers' Club, New York, Tuesday, March 11, 1913, at 8 p. m. There will be an informal dinner at 6:30 p. m. at the same place.

Railway Club of Pittsburgh.

At the regular monthly meeting of the Railway Club of Pittsburgh, to be held at the Monongahela House, Pittsburgh, Pa., February 28, Gilbert E. Ryder, of the Locomotive Superheater Company, New York, will read a paper on The Operation and Maintenance of Superheater Locomotives.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 6-9, St. Louis, Mo.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec, Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-23, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Convention, March 18-20, 1913, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 22-25, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCES' ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meeting with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Tuesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City, Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, March 17, Chicago; June 10-11, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala. Next meeting, April 17, Atlanta, Ga.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August. Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The government has filed suit in the Commerce Court against the Erie Railroad charging violation of law in granting passes to representatives of trans-Atlantic steamship companies. The steamship lines are not subject to the act to regulate commerce and they have no arrangement with the railroads for carrying freight on through bills of lading.

The five principal express companies, reporting to the Interstate Commerce Commission, in accordance with the order of the commission, have presented estimates of the probable diminution in their receipts if the reduced rates proposed by the commission were to be adopted. The estimates are based on the actual traffic carried on a single day in October last. The companies say that the losses would amount to from 22 per cent. to 31 per cent. of their gross receipts. The loss for 12 months would be several times greater than the net returns from operation for the last fiscal year. The greatest loss is said to be that on shipments weighing less than 40 lbs., and especially on those weighing less than 20 lbs. each. The companies say that a reduction on interstate traffic would force some reductions on intrastate traffic, and that if the commission's proposed scheme of reduction were applied to all of the intrastate traffic the loss would be about two-thirds that of the estimated loss on interstate traffic

The New York, Westchester & Boston, the electric road opened from New York to New Rochelle and White Plains last May, and whose officers have intelligently cultivated the friendship of the public, has issued a notice calling the attention of passengers to the fact that they may send complaints and criticisms direct to the president of the road. The notice, posted in the stations and cars, reads: "For the safety and convenience of the public it is necessary that rules be enforced. The enforcement of these rules may temporarily inconvenience a few. For the convenience of our patrons who desire to make complaints or suggestions relative to the service, station agents and conductors are provided with blanks which may be obtained on application and which when filled out and signed may be forwarded to the president." An officer of the road, speaking of the new notice, observes, with truth, that it will steady the employee in the performance of his duties. When a question arises with a passenger, both the passenger and the employee will more readily see that a prolonged argument will be unsatisfactory on both sides.

To Make New York a Way-Station?

"In our own particular branch of business the most important thing for us is to secure rebilling from New York to points beyond, on the through rate from the originating point of shipment on the same terms that are allowed the western terminals. The Pennsylvania and Lehigh Valley railroads have in a modified form made New York a rebilling point. Grain can now be rebilled from the Pennsylvania and Lehigh tracks, but not from the elevator. In practice this privilege, while incomplete, is valuable, for it somewhat enlarges our power of distribution. In principle it is admirable, for it admits our contention that New York is entitled to rebilling and those roads have the thanks of the trade. What we require is rebilling from the elevators as well as from the tracks. That would enable us to carry a stock always available for New England delivery."—*E. T. Cushing, before New York Oats Trade.*

INTERSTATE COMMERCE COMMISSION.

The commission has further suspended from February 5 until August 5 certain schedules contained in Leland's tariff, which advance rates for the transportation of fence posts from stations in Arkansas to Kansas City, Mo., and other points.

The commission has suspended from February 12, until August 12, the schedules in W. H. Hosmer's tariff which contain new rules governing allowances made by carriers for stoves and lining of cars used in the transportation of potatoes.

The commission has suspended from February 12, until June 12, the schedules in certain tariffs, which advance rates for the transportation of excelsior from St. Paul, Minn., and other points to Chicago, Kansas City, Mo., and other points.

The commission has suspended until June 14, 1913, certain tariffs which contain advances in rates on grain from certain points in South Dakota and adjoining territory to Chicago and Milwaukee, Wis., ranging from ½ to 3½ cents per 100 lbs.

The commission has suspended from February 13, until August 13, a supplement to the tariff of the Galveston, Harrisburg & San Antonio, which provides for the withdrawal of rules and regulations governing the reconsignment of lumber at El Paso, Tex.

The commission has suspended from February 18 until August 18, certain schedules in the tariff of the El Paso & Southwestern, which advance rates for the transportation of coal from Dawson, N. Mex., to certain stations located on the Wichita Falls & Northwestern.

The Interstate Commerce Commission has suspended from February 19 to August 19, a certain freight tariff filed by the Pere Marquette; supplement No. 12 to tariff No. 2594. In this tariff the road proposed to advance "break bulk" rates on grain from Milwaukee and other points to Atlantic seaboard points.

The commission has issued a notice, dated January 7, tentatively endorsing the changes made in the car demurrage rules by the American Railway Association at its last meeting, in November. The commission recommends that these rules be incorporated in all interstate tariffs, but reserves the right to inquire into the legality or reasonableness of any rule which may be complained of.

The commission has suspended until June 10, items in certain tariffs which advance rates for the transportation of brooms 10 cents per 100 lbs. in carloads from Chicago and Peoria, Ill., St. Paul, Minn., etc., Missouri River points and points in Mississippi River territory to Denver, Col., and other points taking same rates. The present rate from Chicago to Denver is $1.10 per 100 lbs., and the proposed rate is $1.20 per 100 lbs.

The commission has suspended until March 31, the schedules in supplements to the tariff of the Texas & Pacific, which advance rates 2 cents per 100 lbs. for the transportation of lumber from Alexandria, La., to New Orleans, La., when for beyond, and also advance by a like amount rates on certain kinds of lumber from Louisiana points to Cairo, Ill., St. Louis, Mo., and other points. Similar advances in tariffs of other carriers are under suspension by previous orders in the same docket.

The commission, by order No. 5518, announces that it is going to make a general inquiry into the practices of all railroads in the issuance of freight bills. Complaint has been made that unjust and unreasonable regulations are in force. The commission will inquire particularly as to whether such bills show the route, name of initial carrier, junction points, full statement of charges accruing enroute, for reconsignment, switching, storage, etc., and as to whether the bill presented to the consignee always shows the name of the consignor and the date of arrival of goods.

Complaint Dismissed.

Wichita Wholesale Furniture Company v. St. Louis, Iron Mountain & Southern et al. Opinion by the commission:

The complainant contends that the rate of 50 cents per 100 lbs. for the transportation of furniture in carloads from Fort Smith, Ark., to Wichita, Kan., is unreasonable. The commission found that the evidence was not conclusive. (26 I. C. C., 107.)

Texhoma Mill & Elevator Company v. Chicago, Rock Island & Pacific et al. Opinion by the commission:

Complainant contends that the rate of 2½ cents per 100 lbs. for the transportation of grain in carloads from Texhoma, Okla., to Texhoma, Tex., is unreasonable on the ground that the service performed is merely a switching service. The commission found that the complainant's shipments were made as through interstate movements to points beyond Texhoma, Tex., and that as the through rate was not complained of, the rate between the two points in question could not be found unreasonable. (26 I. C. C., 94.)

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1912.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total. inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama Great Southern	309	$293,791	$132,205	$470,792	$52,383	$107,385	$12,119	$146,017	$8,446	$326,350	$144,442	—$956	$16,815	$126,671	—$5,189
Ann Arbor	292	128,234	46,474	186,103	26,008	22,999	4,326	66,867	7,811	128,011	58,092	1,166	13,930	45,328	—956
Arizona Eastern	366	171,041	38,672	221,953	24,178	18,605	2,459	59,317	7,536	112,095	109,858	145	4,660	105,343	47,982
Atlanta, Birmingham & Atlantic	662	208,433	65,612	294,781	51,377	43,978	14,741	110,629	12,095	232,820	61,961	.....	13,375	48,586	—25,197
Atlantic City	167	57,353	48,826	113,493	55,445	14,016	2,065	83,513	1,935	156,974	—43,481	—2,998	9,000	—55,479	—37,974
Baltimore & Ohio Chicago Terminal	77	.....	1,775	143,180	18,801	29,477	844	80,202	4,710	134,034	9,146	847	19,115	—9,122	4,837
Belt Ry. Co. of Chicago	21	.....	.....	283,122	14,100	33,849	510	125,389	5,011	178,859	104,263	.....	8,232	96,031	3,434
Boston & Maine	2,244	2,350,098	1,194,530	3,861,894	511,287	623,237	28,108	2,088,824	117,822	3,369,272	492,622	15,373	187,490	320,505	—207,542
Butte, Anaconda & Pacific	46	94,960	8,406	111,284	11,234	21,825	761	56,171	3,218	93,209	18,075	.....	2,639	15,436	—7,908
Canadian Pacific Lines in Maine	233	111,670	46,722	164,622	35,748	14,011	6,123	69,693	5,684	131,259	33,363	.....	10,000	23,363	—9,932
Central of Georgia	1,915	749,216	384,324	1,246,296	166,679	193,214	34,292	422,849	38,124	855,158	391,138	6,421	67,444	350,115	—9,572
Central Vermont	411	224,219	76,003	326,332	34,336	71,046	7,666	173,975	9,860	296,883	29,449	56	12,200	17,305	—26,311
Charleston & Western Carolina	341	136,034	38,057	182,479	26,641	15,743	2,910	67,167	4,500	116,961	65,518	.....	5,000	60,518	18,191
Chicago & Eastern Illinois	1,275	982,399	268,722	1,358,520	169,433	289,545	25,198	530,881	39,189	1,054,246	304,274	—2,205	50,000	252,069	—98,846
Chicago & Erie	270	345,899	66,805	458,661	64,323	105,013	20,737	240,697	9,749	440,519	18,142	—1,196	13,333	3,613	—34,153
Chicago, Indiana & Southern	359	367,031	20,286	394,958	46,116	82,970	8,119	138,483	9,636	285,324	109,634	—316	24,706	84,612	8,938
Chicago, Peoria & St. Louis	255	115,185	27,523	152,795	30,148	39,272	7,003	82,063	6,300	164,786	—11,991	.....	4,300	—16,291	—21,189
Chicago, Terre Haute & Southeastern	351	165,754	18,858	189,278	19,616	27,923	3,532	62,258	8,340	121,669	67,609	—201	10,000	57,408	11,457
Cincinnati, New Orleans & Texas Pacific	337	727,251	180,889	956,181	92,951	204,767	23,195	270,972	19,456	611,341	344,840	—1,801	29,800	313,239	71,588
Cincinnati Northern	245[1]	113,617	17,623	139,080	10,602	21,894	2,282	57,603	3,777	96,158	42,922	.....	6,362	36,560	24,019
Cleveland, Cincinnati, Chic. & St. Louis	2,011	2,092,512	696,898	3,038,365	347,178	617,507	71,840	1,282,980	61,786	2,381,291	657,074	—2,255	125,243	529,576	—72,716
Colorado Midland	338	114,021	17,542	153,702	15,312	34,781	7,089	64,478	5,644	127,304	26,398	3,261	10,000	19,659	17,290
Colorado & Southern	1,073[2]	635,509	99,992	790,180	90,459	161,536	9,541	232,887	22,693	517,116	273,064	—1,492	29,175	242,397	—5,105
Delaware & Hudson Co.—R. R. Dept.	854[3]	1,718,336	212,236	1,994,287	130,498	332,306	19,466	667,143	58,880	1,208,293	785,994	—1,026	61,768	723,200	—81,420
Denver & Rio Grande	2,560[4]	1,560,944	379,845	2,031,602	172,277	367,407	45,024	698,380	56,113	1,339,201	692,401	—5,598	93,750	593,053	133,108
Denver, Northwestern & Pacific	215	77,637	13,873	95,594	13,603	17,006	1,885	37,892	6,865	77,251	18,343	.....	3,500	14,843	2,955
Detroit, Toledo & Ironton	441	130,978	13,414	153,748	36,702	20,293	2,590	81,252	5,692	146,529	7,219	.....	6,000	1,219	—7,087
Detroit & Toledo Shore Line	79	116,012	.....	116,292	757	4,945	1,123	33,905	2,170	42,900	73,392	.....	4,830	68,562	—3,533
Detroit River Tunnel	2	.....	.....	110,760	2,298	2,623	.....	9,508	73	14,502	96,258	.....	3,008	93,250	—131,350
Duluth, South Shore & Atlantic	628[5]	155,610	78,525	246,779	39,299	31,965	11,699	102,198	9,114	194,275	52,504	—172	17,913	34,419	—12,465
Erie	1,988[6]	3,187,938	756,770	4,310,517	455,935	811,526	101,243	1,548,509	86,409	3,003,622	1,306,895	—95,433	152,835	1,058,627	12,771
Galveston, Harrisburg & San Antonio	1,338	755,415	293,713	1,103,467	112,919	238,063	35,526	449,263	30,773	866,544	236,923	—5,446	30,702	200,775	151,007
Georgia	307	171,577	87,752	277,495	32,885	42,743	11,419	124,881	8,270	220,198	57,297	.....	2,627	54,670	—47,776
Georgia, Southern & Florida	395	121,389	81,711	240,423	29,388	40,875	7,835	89,975	8,966	177,039	63,384	.....	13,634	49,750	—6,105
Grand Rapids & Indiana	578[7]	277,648	144,231	458,464	52,419	66,695	12,865	193,481	16,661	342,121	116,343	49	26,312	90,080	16,313
Gulf, Colorado & Santa Fe	1,596[8]	992,203	287,257	1,355,113	231,318	176,464	24,134	480,733	30,807	943,456	411,657	.....	44,880	366,777	—4,424
Hocking Valley	352	496,535	75,649	604,024	56,198	120,725	9,946	198,136	14,458	399,463	204,561	.....	44,400	160,161	—4,786
Houston, East & West Texas	190	85,903	34,439	128,615	34,477	16,464	2,375	40,518	3,913	97,747	30,868	.....	3,818	27,050	—563
Houston & Texas Central	789	395,955	175,668	616,197	100,796	116,749	17,254	248,834	17,338	500,971	115,226	—1,571	21,092	92,463	30,366
Indiana Harbor Belt	105	.....	.....	272,961	32,907	32,660	2,769	130,668	6,389	205,393	67,568	577	5,754	62,391	—11,688
Kanawha & Michigan	176	196,331	32,401	234,590	32,399	51,716	2,684	72,197	6,493	165,489	69,101	—27	8,468	60,606	—20,249
Kansas City Southern	827	677,456	158,222	916,957	92,916	102,158	25,347	320,645	33,677	574,743	342,214	.....	39,279	302,935	81,665
Louisiana & Arkansas	255	117,340	23,831	146,226	19,108	19,631	2,404	40,203	5,103	86,449	59,777	.....	3,834	55,943	18,451
Louisiana Western	208	127,278	66,444	201,937	28,176	33,475	5,383	59,337	6,435	132,806	69,131	—865	11,714	56,552	28,783
Minneapolis, St. Paul & Sault Ste. Marie	3,976[9]	1,998,852	568,320	2,703,904	187,675	341,435	52,363	858,948	56,291	1,496,712	1,207,192	10,227	108,268	1,109,151	425,916
Missouri, Kansas & Texas System	3,817[10]	1,879,429	926,087	2,971,492	345,943	302,007	61,008	1,116,007	111,527	1,936,492	1,035,000	—6,953	133,842	894,205	294,131
Mobile & Ohio	1,144	814,706	140,787	1,031,047	108,797	204,712	38,707	366,910	31,511	750,637	280,410	—1,725	29,859	248,826	—13,467
Morgan's La. & Tex. R. R. & S. S. Co.	404	354,077	111,005	487,450	65,049	53,257	10,227	177,450	11,945	317,928	169,522	—2,024	21,105	146,393	—62,840
Nashville, Chattanooga & St. Louis	1,231	759,658	272,689	1,107,619	177,099	147,578	42,603	457,441	40,524	865,245	242,374	—60	25,416	216,898	30,283
New Orleans, Texas & Mexico	277	126,392	19,348	154,222	21,683	19,181	3,415	63,875	7,127	115,281	38,941	.....	4,000	34,941	68,537
New York, Chicago & St. Louis	565[11]	915,403	132,511	1,085,032	41,625	106,984	58,638	481,761	18,068	707,076	377,956	—2,166	21,584	354,206	—17,282
New York, Ontario & Western	566	587,366	87,138	705,240	77,351	119,984	10,215	292,002	20,819	520,371	184,869	906	18,167	167,608	38,796
New York, Susquehanna & Western	154[12]	169,501	45,912	250,620	22,611	24,896	1,533	108,169	4,701	161,910	88,710	—3,041	14,673	70,996	—11,361
Northwestern Pacific	401[13]	100,852	132,206	257,700	49,605	39,272	3,347	109,482	13,367	215,073	42,627	.....	12,579	30,048	—1,982
Oahu Ry. & Land Co.	101[14]	48,626	24,554	78,972	9,555	6,613	922	19,858	7,430	44,378	34,594	33,088	3,516	64,166	—12,520
Oregon Short Line	1,827[15]	1,320,116	398,801	1,837,756	217,752	216,692	29,228	498,496	39,992	1,002,160	835,596	—464	225,823	609,309	—39,474
Oregon-Washington R. R. & Nav. Co.	1,919	978,299	409,299	1,491,255	243,844	178,102	56,907	563,292	51,669	1,093,814	397,441	—5,225	120,509	271,707	36,965
Pecos & Northern Texas	479	171,315	46,050	228,292	30,540	41,048	4,144	70,790	6,209	152,731	75,561	.....	4,464	71,097	33,539
Peoria & Eastern	352	255,345	70,604	345,622	30,131	61,541	4,307	131,328	5,620	232,927	112,695	.....	15,548	97,147	—12,241
Pere Marquette	2,330	1,121,025	322,032	1,566,646	235,003	215,614	32,726	657,295	33,875	1,174,513	392,133	—9,762	56,935	325,436	30,624

Average mileage operated during previous period—[1] 246; [2] 1,110; [3] 852; [4] 2,556; [5] 623; [6] 1,995; [7] 587; [8] 1,603; [9] 3,770; [10] 3,399; [11] 562; [12] 152; [13] 404; [14] 99; [15] 1,762.
— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1912—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Philadelphia & Reading	1,015	$3,531,828	$581,793	$4,326,309	$374,581	$617,858	$39,139	$1,427,373	$65,242	$2,524,193	$1,802,116	$30,722	$86,364	$1,746,474	$118,754
Pittsburgh & Lake Erie	223[16]	1,369,401	148,027	1,576,936	168,797	165,094	13,310	384,288	26,369	757,858	819,078	—327	31,789	786,962	324,220
Port Reading	21	122,562	.....	123,982	8,419	548	30	37,594	231	46,822	77,160	3,203	8,000	72,363	—5,921
Rutland	468	164,053	96,828	299,479	44,621	62,219	8,088	127,784	8,871	251,583	47,896	.....	12,825	35,071	—23,534
St. Joseph & Grand Island	319	76,384	32,646	121,144	26,056	21,158	4,395	55,143	6,323	113,075	8,069	—100	4,574	3,395	29,773
St. Louis, Brownsville & Mexico	510	151,968	78,415	246,454	36,452	22,834	4,693	118,533	9,938	192,450	54,004	.....	7,947	46,057	6,159
St. Louis Southwestern	906[17]	600,688	163,970	818,870	96,686	99,780	36,766	161,379	24,798	419,409	399,461	—776	24,136	374,549	48,477
St. Louis Southwestern of Texas	703	320,932	113,559	462,222	97,606	76,103	17,866	179,192	22,667	393,434	68,788	—216	12,205	56,367	—38,167
San Antonio & Aransas Pass	727	287,008	119,684	429,727	55,996	54,667	5,938	163,287	10,150	290,038	139,689	.....	12,000	127,689	23,170
San Pedro, Los Angeles & Salt Lake	1,135[18]	549,199	275,331	889,219	141,584	137,915	31,137	293,635	19,822	624,093	265,126	—1,479	34,022	229,625	150,282
Southern in Mississippi	281	77,563	50,285	136,769	23,233	10,677	2,136	50,627	4,943	91,616	45,153	.....	6,762	38,391	172
Southern Kansas of Texas	125	108,510	18,763	132,192	9,118	24,421	2,353	40,040	3,559	79,551	52,641	.....	2,765	49,876	32,509
Southern Pacific	6,322[19]	4,497,018	2,712,834	7,817,598	998,553	1,177,445	161,091	2,298,775	212,341	4,848,205	2,969,393	209,399	421,746	2,757,046	164,604
Spokane, Portland & Seattle	556[20]	269,907	139,162	438,052	54,502	38,892	6,342	106,181	13,382	219,299	218,753	—232	53,400	165,121	—31,317
Tennessee Central	294	98,161	35,794	141,697	27,987	14,560	5,897	57,111	6,626	112,181	29,516	.....	4,265	25,251	7,781
Texas & Pacific	1,885	1,265,336	490,988	1,846,993	155,997	233,270	37,093	809,522	47,123	1,283,005	563,988	—13,284	91,840	458,864	—45,695
Texas & New Orleans	458	231,178	106,398	363,350	68,039	84,291	8,858	148,946	13,370	323,504	39,846	10,506	14,010	36,342	—36,003
Toledo & Ohio Central	443	369,337	50,627	441,662	56,257	82,498	7,214	180,574	9,342	335,885	105,777	—940	26,633	78,204	—7,325
Toledo, Peoria & Western	248	71,464	42,595	119,759	31,888	22,798	2,262	44,351	3,593	104,892	14,867	.....	4,800	10,067	229
Toledo, St. Louis & Western	451	325,426	32,418	378,697	23,899	42,191	15,901	130,489	8,732	221,212	157,485	.....	14,800	142,685	56,705
Trinity & Brazos Valley	463	289,641	49,089	352,950	47,824	41,635	9,956	155,386	15,222	270,023	82,927	.....	4,588	78,339	47,182
Vandalia	827	681,405	204,013	984,540	82,592	232,050	23,868	375,334	18,995	732,839	251,701	.....	36,947	214,754	42,503
Virginia & Southwestern	240	117,646	15,832	137,276	21,700	34,017	2,166	39,482	3,749	101,114	36,162	.....	5,500	30,662	4,554
Wabash	2,515	1,840,117	638,065	2,672,613	346,147	457,775	82,811	1,212,014	66,836	2,165,583	507,030	—3,133	71,655	432,242	23,675
Western Maryland	543	487,198	71,487	594,827	90,372	95,401	14,081	283,677	21,039	504,570	90,257	.....	20,000	70,257	—112,949
Western Pacific	937	378,787	95,328	490,144	72,128	44,658	35,086	210,943	24,084	386,899	103,245	—1,520	21,077	80,648	67,391
Wheeling & Lake Erie	459[21]	517,789	49,638	606,081	104,055	124,382	7,261	208,338	24,991	469,027	137,054	1,662	30,081	108,635	—19,355
Yazoo & Mississippi Valley	1,374	761,313	322,908	1,144,921	127,032	152,284	15,569	446,133	26,580	767,598	377,323	495	37,000	340,818	27,069

SIX MONTHS OF FISCAL YEAR, 1913.

Alabama Great Southern	309	$1,709,005	$686,245	$2,621,389	$309,090	$552,452	$75,024	$815,003	$55,449	$1,807,018	$814,371	—$3,089	$88,357	$722,925	$42,452
Ann Arbor	292	706,231	312,121	1,087,772	139,159	136,623	25,018	374,436	46,559	721,795	365,977	1,658	83,579	284,056	—61,231
Arizona Eastern	366	983,852	225,920	1,282,724	129,398	85,817	15,300	317,543	54,459	602,517	680,207	563	45,142	635,628	279,212
Atlanta, Birmingham & Atlantic	662	1,195,251	367,383	1,669,879	264,951	255,113	96,272	649,623	70,446	1,336,405	333,474	.....	81,100	252,374	—156,107
Atlantic City	167	399,715	802,975	1,272,902	184,387	78,467	18,563	608,830	9,002	899,249	373,653	—22,473	54,000	297,180	—64,059
Baltimore & Ohio Chicago Terminal	77	.....	12,944	950,837	144,780	138,784	4,422	417,080	26,895	731,691	218,876	5,374	114,692	109,558	57,231
Belt Ry. Co. of Chicago	21	.....	.....	1,612,399	100,475	202,515	3,057	655,948	34,110	996,105	616,294	.....	46,734	569,560	35,203
Boston & Maine	2,244	14,716,769	8,998,586	25,614,278	3,158,384	3,701,984	213,491	11,406,498	601,802	19,082,159	6,532,119	96,069	1,071,222	5,556,966	531,816
Butte, Anaconda & Pacific	45	525,542	76,820	658,091	87,180	128,774	4,399	307,989	18,624	546,966	111,125	.....	12,638	98,487	—8,047
Canadian Pacific Lines in Maine	233	342,805	160,574	549,750	197,031	73,734	35,190	236,717	28,908	571,580	—21,830	.....	60,000	—81,830	—50,694
Central of Georgia	1,915	4,592,941	2,102,456	7,325,372	1,025,251	1,240,902	212,958	2,421,997	235,732	5,136,840	2,188,532	37,993	299,675	1,926,850	—160,587
Central Vermont	411	1,380,220	639,394	2,188,349	266,419	359,795	51,488	1,047,740	49,948	1,775,390	412,959	1,953	73,200	341,712	—103,575
Charleston & Western Carolina	341	696,341	198,707	943,617	171,136	144,157	19,935	356,369	27,956	719,553	224,064	.....	30,000	194,064	—70,352
Chicago & Eastern Illinois	1,275	6,145,221	1,603,954	8,404,080	1,099,109	1,681,784	148,749	3,040,984	256,371	6,226,997	2,177,083	—13,851	261,000	1,902,232	—371,496
Chicago & Erie	270	2,209,772	400,067	2,863,785	523,444	596,573	124,493	1,405,296	64,337	2,714,143	149,642	—7,085	78,685	63,872	—251,297
Chicago, Indiana & Southern	359	1,982,669	162,499	2,210,029	291,149	542,291	48,271	710,588	51,463	1,643,762	566,267	4,214	103,706	466,775	240,056
Chicago, Peoria & St. Louis	255	693,041	189,963	930,415	151,516	205,522	42,070	425,145	34,246	858,499	71,916	.....	25,800	46,116	—57,528
Chicago, Terre Haute & Southeastern	351	896,470	112,077	1,033,943	173,062	191,740	18,546	319,068	46,513	748,929	285,014	—1,241	60,000	223,773	—42,315
Cincinnati, New Orleans & Texas Pacific	337	3,958,594	961,847	5,179,959	522,534	1,173,185	136,547	1,436,183	114,702	3,383,151	1,796,808	—3,052	170,800	1,622,956	—16,496
Cincinnati Northern	245[1]	642,489	121,301	801,891	113,388	127,494	15,428	308,298	20,061	584,669	217,222	.....	32,862	184,360	74,811
Cleveland, Cincinnati, Chic. & St. Louis	2,011	12,219,002	4,325,004	18,019,424	2,061,351	3,151,349	422,872	6,593,980	347,207	12,576,759	5,442,665	—4,397	620,243	4,818,025	583,068
Colorado Midland	338	859,319	163,679	1,115,479	138,615	204,919	43,389	467,327	33,211	887,461	228,018	1,551	53,600	175,969	—6,151
Colorado & Southern	1,073[2]	3,491,568	798,760	4,576,916	633,277	986,191	63,854	1,318,960	130,224	3,132,506	1,444,410	—4,433	175,000	1,264,927	—81,827
Delaware & Hudson Co.—R. R. Dept	854[3]	10,105,174	1,785,265	12,308,060	1,003,642	1,703,416	145,747	4,081,399	328,119	7,262,323	5,045,737	—58,267	305,866	4,681,604	87,150
Denver & Rio Grande	2,560[4]	9,974,566	2,978,819	13,553,609	1,803,427	2,287,958	291,536	4,236,194	345,093	8,964,208	4,589,401	16,119	482,500	4,123,020	826,464
Denver, Northwestern & Pacific	215	452,426	188,156	669,492	99,441	100,164	11,716	204,678	25,133	441,132	228,360	.....	21,000	207,360	—19,946
Detroit, Toledo & Ironton	441	763,987	90,349	920,327	184,068	100,612	16,299	410,704	31,620	743,303	177,024	—11	36,000	141,013	25,201
Detroit & Toledo Shore Line	79	650,385	.....	652,823	88,838	35,918	6,934	179,438	13,901	325,029	327,794	.....	28,260	299,534	17,937
Detroit River Tunnel	2	.....	.....	595,768	12,857	16,868	.....	50,152	238	80,115	515,653	.....	25,508	490,145	—128,047
Duluth, South Shore & Atlantic	628[5]	1,099,087	541,102	1,723,721	377,537	195,647	63,066	642,901	69,101	1,348,252	375,469	5,367	107,914	272,922	—145,725

Average mileage operated during previous period—[16] 215; [17] 842; [18] 1,116; [19] 6,191; [20] 551; [21] 457; [1] 246; [2] 1,110; [3] 852; [4] 2,556; [5] 623.
— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

SIX MONTHS OF FISCAL YEAR, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total. inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Erie	1,988[6]	$20,824,452	$5,099,509	$28,071,256	$3,374,445	$4,758,111	$575,403	$9,011,749	$514,130	$18,233,838	$9,837,418	—$88,594	$874,145	$8,874,679	$665,953
Galveston, Harrisburg & San Antonio	1,338	4,457,491	1,604,671	6,374,532	563,840	1,302,192	194,357	2,349,544	186,137	4,596,070	1,778,462	—30,510	200,530	1,547,422	246,885
Georgia	307	978,738	468,345	1,555,685	200,649	290,630	69,721	777,871	49,468	1,388,339	167,346	.....	17,593	149,753	—387,355
Georgia, Southern & Florida	395	667,235	430,418	1,266,776	154,534	248,111	45,716	503,857	57,032	1,009,250	257,526	.....	70,214	187,312	—72,545
Grand Rapids & Indiana	578[7]	1,650,017	1,054,369	2,939,553	356,962	413,372	71,359	1,170,657	93,917	2,106,267	833,286	166	143,219	690,233	47,847
Gulf, Colorado & Santa Fe	1,596[8]	5,454,124	1,688,211	7,546,599	1,132,710	1,016,366	143,955	2,542,926	191,934	5,027,891	2,518,708	.....	243,461	2,275,247	651,673
Hocking Valley	352	3,397,652	509,246	4,180,894	425,850	814,416	53,869	1,179,989	85,181	2,559,305	1,621,589	.....	237,600	1,383,989	121,673
Houston, East & West Texas	190	480,439	190,350	711,614	140,415	88,214	12,382	222,814	21,905	485,730	225,884	.....	22,452	203,432	—11,335
Houston & Texas Central	789	2,463,650	1,039,603	3,734,606	456,663	615,270	106,980	1,394,521	98,534	2,671,968	1,062,638	—8,845	117,022	936,771	137,348
Indiana Harbor Belt	105	.....	.....	1,578,186	180,226	200,338	16,218	650,894	36,481	1,084,157	494,029	16,294	33,554	476,769	131,391
Kanawha & Michigan	176	1,460,433	203,907	1,701,312	232,246	299,404	14,011	472,824	38,171	1,056,656	644,656	—124	54,114	590,418	—46,752
Kansas City Southern	827	4,076,579	900,747	5,510,720	547,745	699,579	153,860	1,749,157	190,123	3,340,464	2,170,256	.....	218,488	1,951,768	480,072
Louisiana & Arkansas	255	650,530	129,573	810,985	132,026	126,642	14,754	222,247	29,452	525,121	285,864	.....	23,902	261,962	63,543
Louisiana Western	208	735,240	343,575	1,128,413	122,862	188,350	39,971	337,655	33,377	722.215	406,198	1,824	46,656	361,366	122,735
Minneapolis, St. Paul & Sault Ste. Marie	3,976[9]	12,426,074	3,666,011	16,936,243	1,762,805	1,888,246	322,447	4,848,444	314,635	9,136,577	7,799,666	112,964	864,967	7,047,663	1,828,259
Missouri, Kansas & Texas System	3,817[10]	11,665,061	4,993,296	17,624,286	2,334,919	2,126,918	367,200	5,974,569	512,213	11,315,819	6,308,467	—31,895	662,643	5,613,929	1,873,925
Mobile & Ohio	1,114	4,981,547	792,780	6,136,091	713,168	1,164,627	223,741	2,149,423	185,208	4,436,167	1,699,924	—8,568	179,154	1,512,202	—33,458
Morgan's La. & Tex. R. R. & S. S. Co.	404	1,766,716	572,122	2,468,850	411,582	376,025	73,607	976,817	63,512	1,901,543	567,307	—11,406	112,289	443,612	—200,393
Nashville, Chattanooga & St. Louis	1,231	4,558,284	1,628,956	6,630,519	1,005,187	1,167,587	237,711	2,501,919	176,815	5,089,219	1,541,300	—3,301	152,496	1,385,503	86,535
New Orleans, Texas & Mexico	277	634,439	109,761	807,086	145,663	73,375	19,729	341,255	36,173	616,195	190,891	.....	12,382	178,509	68,537
New York, Chicago & St. Louis	565[11]	5,384,303	880,083	6,498,966	660,928	732,491	313,968	2,603,251	100,730	4,411,368	2,087,598	—9,088	201,583	1,876,927	148,856
New York, Ontario & Western	566	3,724,952	1,068,264	5,046,361	639,852	731,585	68,430	1,768,991	101,216	3,310,074	1,736,287	—5,395	109,000	1,621,892	336,201
New York, Susquehanna & Western	154[12]	981,341	302,955	1,447,599	190,857	180,489	11,566	611,671	27,325	1,021,908	425,691	2,288	96,964	331,015	—209,267
Northwestern Pacific	401[13]	821,857	1,093,067	2,050,419	275,398	226,730	22,036	694,039	77,829	1,296,032	754,387	.....	75,474	678,913	55,817
Oahu Ry. & Land Co	101[14]	411,147	135,357	585,046	55,274	37,460	3,553	123,229	27,651	247,167	337,879	18,517	36,016	320,380	40,969
Oregon Short Line	1,827[15]	8,725,904	2,710,693	12,110,524	1,188,859	1,217,461	171,123	2,894,028	242,907	5,714,378	6,396,146	10,592	832,277	5,574,461	501,590
Oregon-Washington R. R. & Nav. Co.	1,919	6,451,083	2,808,713	9,861,654	1,245,028	1,008,189	276,555	3,345,409	279,398	6,154,579	3,707,075	—19,517	573,418	3,114,140	320,225
Pecos & Northern Texas	479	1,008,813	272,876	1,373,441	160,906	248,626	21,691	401,502	37,361	870,086	503,355	.....	26,260	477,095	223,501
Peoria & Eastern	352	1,412,584	394,014	1,923,420	226,996	338,169	27,167	677,390	34,123	1,303,845	619,575	.....	68,748	550,827	120,022
Pere Marquette	2,330	6,159,180	2,316,523	9,249,849	1,377,906	1,523,605	207,383	3,698,120	216,361	7,023,375	2,226,474	14,849	342,019	1,899,304	—154,675
Philadelphia & Reading	1,015	20,927,433	3,726,323	25,902,220	2,357,926	4,074,151	256,114	7,991,363	367,081	15,046,635	10,855,585	204,370	518,139	10,541,816	2,161,376
Pittsburgh & Lake Erie	223[16]	8,824,987	903,740	10,091,683	960,669	1,402,141	88,275	2,145,894	150,782	4,747,761	5,343,922	—1,824	186,789	5,155,309	1,290,248
Port Reading	21	802,373	.....	818,056	62,596	2,449	183	210,388	1,033	276,649	541,407	38,890	48,000	532,297	158,533
Rutland	468	1,055,730	689,970	1,995,236	236,915	372,625	51,812	754,837	40,496	1,456,685	538,551	.....	79,870	458,681	—19,452
St. Joseph & Grand Island	319	568,252	219,456	862,200	171,547	115,880	28,823	362,850	33,162	712,262	149,938	—1,275	36,553	112,110	3,864
St. Louis, Brownsville & Mexico	510	889,339	453,982	1,432,727	231,920	153,036	29,401	647,872	55,698	1,117,927	314,800	.....	35,447	279,353	—66,328
St. Louis Southwestern	906[17]	3,364,940	826,112	4,401,836	513,513	625,777	175,612	1,014,897[1]	152,046	2,481,845	1,919,991	—4,560	144,426	1,771,005	171,221
St. Louis Southwestern of Texas	703	1,872,566	649,055	2,678,826	467,458	480,940	77,265	981,185	115,950	2,122,798	556,028	—1,207	63,705	491,116	—12,932
San Antonio & Aransas Pass	727	2,030,446	775,496	2,935,398	397,798	325,402	36,295	973,081	61,911	1,794,487	1,140,811	.....	72,000	1,068,811	198,421
San Pedro, Los Angeles & Salt Lake	1,135[18]	3,234,489	1,578,356	5,180,750	578,079	830,693	184,661	1,622,523	114,925	3,330,881	1,849,869	—10,051	195,333	1,644,485	1,162,511
Southern in Mississippi	281	380,810	202,297	629,589	161,766	52,936	14,271	250,275	24,711	503,959	125,630	.....	40,570	85,060	—56,130
Southern Kansas of Texas	125	673,768	116,950	820,375	57,669	156,098	13,167	233,652	21,575	482,161	338,214	.....	12,202	326,012	196,694
Southern Pacific	6,322[19]	31,039,972	16,597,595	51,036,357	5,235,735	6,683,518	1,008,994	13,453,109	1,258,963	27,640,319	23,396,038	926,201	2,248,148	22,074,091	2,448,953
Spokane, Portland & Seattle	556[20]	1,674,045	921,578	2,800,805	296,952	230,802	47,709	645,079	76,103	1,296,645	1,504,160	3,254	320,400	1,187,014	8,532
Tennessee Central	294	576,304	233,199	855,078	183,510	85,840	36,243	292,531	42,424	640,548	214,530	.....	25,587	188,943	26,685
Texas & New Orleans	458	1,382,205	592,900	2,109,813	357,667	487,935	46,641	816,277	69,351	1,777,871	331,942	12,595	76,548	267,989	18,992
Texas & Pacific	1,885	6,793,946	2,483,540	9,907,070	1,269,458	1,502,078	203,630	4,291,540	277,086	7,543,792	2,363,278	—20,006	339,687	2,003,585	—654,460
Toledo & Ohio Central	443	2,423,730	350,142	2,943,963	405,795	519,653	41,620	967,436	54,800	1,989,304	954,659	—4,538	127,660	822,461	139,590
Toledo, Peoria & Western	248	420,081	264,255	724,813	126,480	143,240	14,930	254,833	20,901	560,784	164,429	.....	28,800	135,629	35,779
Toledo, St. Louis & Western	451	1,782,095	201,554	2,112,696	307,625	291,430	69,246	708,467	55,217	1,431,985	680,711	.....	88,800	591,911	89,747
Trinity & Brazos Valley	463	1,326,810	311,969	1,699,417	251,192	192,108	60,197	693,719	73,627	1,270,843	428,574	.....	25,513	403,061	147,546
Vandalia	827	4,075,197	1,272,270	5,929,000	750,016	1,099,403	152,509	2,091,271	110,606	4,203,805	1,725,195	.....	187,226	1,537,969	486,538
Virginian & Southwestern	240	772,376	93,789	890,537	136,304	207,387	11,533	246,093	20,692	622,009	268,528	.....	31,600	236,928	—40,791
Wabash	2,515	11,480,632	3,999,656	16,879,943	2,205,746	2,805,159	513,942	6,515,170	387,151	12,427,168	4,452,775	—24,965	429,431	3,998,379	441,405
Western Maryland	543	3,038,980	559,648	3,792,296	615,874	534,669	93,460	1,548,597	81,494	2,874,094	918,202	.....	120,000	798,202	—438,559
Western Pacific	937	2,512,669	727,435	3,340,520	479,315	268,248	180,696	1,219,429	150,210	2,297,898	1,042,622	—2,939	121,844	917,839	303,196
Wheeling & Lake Erie	459[21]	3,776,170	361,324	4,367,738	571,433	780,049	49,513	1,315,939	92,721	2,809,655	1,558,083	15,129	184,236	1,388,976	105,098
Yazoo & Mississippi Valley	1,374	3,862,050	1,439,460	5,684,384	1,034,164	792,598	92,800	2,172,115	162,966	4,254,643	1,429,741	339	222,000	1,208,080	85,926

Average mileage operated during previous period—[6] 1,995; [7] 587; [8] 1,603; [9] 3,770; [10] 3,999; [11] 562; [12] 152; [13] 404; [14] 99; [15] 1,762; [16] 215; [17] 842; [18] 1,116; [19] 6,191; [20] 551; [21] 457.

— Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF EXPRESS COMPANIES AS REPORTED TO THE INTERSTATE COMMERCE COMMISSION.

MONTH OF JULY, 1912.

Name of Company.	Miles of line covered. Steam roads.	Other lines.	Express revenue.	Gross receipts from operation.	Less express privileges. Dr.	Total operating revenues.	Operating expenses. Maintenance.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit —).	Taxes.	Operating income (or loss —).	Increase or decr. (—) comp. with last year.
Adams Express Co.	32,520[1]	4,786	$2,741,036	$2,779,285	$1,371,724	$1,407,561	$64,514	$10,626	$1,105,874	$84,671	$1,265,685	$141,876	$16,634	$125,242	$175,246
American Express Co.	57,335[2]	3,203	3,700,804	3,863,799	1,817,884	2,045,915	55,881	34,925	1,624,802	159,062	1,874,670	171,245	31,071	140,174	57,119
Canadian Express Co.	6,559[3]	847	285,625	292,453	138,790	153,663	—197	1,127	116,046	7,364	124,340	29,323	2,750	26,573	—1,153
Canadian Northern Express Co.	4,344[4]	22	57,849	59,654	23,140	36,514	268	334	17,463	1,585	19,650	16,864	403	16,461	3,905
Globe Express Co.	2,904	...	79,923	81,045	40,461	40,584	893	1,659	25,131	3,980	31,663	8,921	800	8,121	2,150
Great Northern Express Co.	8,645[5]	405	310,224	313,819	187,545	126,274	2,104	2,444	74,946	4,449	83,943	42,331	4,714	37,617	16,477
Northern Express Co.	7,457[6]	277	323,217	326,561	173,469	153,092	1,965	3,216	83,735	8,325	97,241	55,851	4,500	51,351	7,184
*National Express Co.	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Southern Express Co.	32,148[7]	821	1,146,437	1,169,128	578,864	590,264	15,976	8,939	425,849	60,976	511,740	78,524	13,317	65,207	26,352
United States Express Co.	28,817[8]	3,983	1,763,843	1,790,089	888,536	901,553	40,701	11,731	830,549	50,260	933,241	—31,688	10,213	—41,901	—41,696
Wells, Fargo & Co.	64,468[9]	25,825	2,930,306	2,976,424	1,456,716	1,519,708	61,838	32,634	1,123,914	84,629	1,303,015	216,693	30,000	186,693	93,626
Western Express Co.	4,888[10]	12	123,280	125,518	64,913	60,605	753	977	41,726	2,816	46,272	14,333	977	13,356	15,970

Operated in previous periods: Steam Roads—[1] 32,918; [2] 54,304; [3] 6,400; [4] 3,370; [5] 8,466; [6] 7,310; [7] 31,735; [8] 28,965; [9] 47,356; [10] 4,843. Other Lines—[1] 3,754; [2] 2,561; [3] 830; [5] 337; [6] 315; [7] 846; [8] 3,943; [9] 17,334; [10] 8.
*Merged with American Express on July 1, 1912.

MONTH OF AUGUST, 1912.

Name of Company.	Miles of line covered. Steam roads.	Other lines.	Express revenue.	Gross receipts from operation.	Less express privileges. Dr.	Total operating revenues.	Operating expenses. Maintenance.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit —).	Taxes.	Operating income (or loss —).	Increase or decr. (—) comp. with last year.
Adams Express Co.	32,578[1]	4,786	$2,831,524	$2,869,243	$1,434,112	$1,435,131	$75,740	$10,403	$1,113,702	$86,107	$1,285,952	$149,179	$16,634	$132,545	$59,406
American Express Co.	57,337[2]	3,467	3,787,029	3,952,708	1,902,161	2,050,547	67,661	37,332	1,628,160	157,432	1,890,585	159,962	31,032	128,930	—12,141
Canadian Express Co.	6,559[3]	847	278,191	284,345	134,954	149,391	5,781	1,022	115,710	7,448	129,961	19,430	2,750	16,680	—10,272
Canadian Northern Express Co.	4,344[4]	22	57,027	58,707	22,811	35.896	401	276	17,549	1,516	19,742	16,154	404	15,750	5,423
Globe Express Co.	2,863[5]	...	90,728	91,883	45,256	46,627	980	1,727	26,761	4,198	33,666	12,961	800	12,161	5,388
Great Northern Express Co.	8,647[6]	405	345,163	349,203	209,645	139,558	1,183	2,481	78,918	4,507	87,089	52,469	5,045	47,424	24,066
*National Express Co.	...	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Northern Express Co.	7,457[7]	277	318,511	321,993	172,263	149,730	1,003	3,122	85,798	5,210	95,133	54,597	4,500	50,097	16,178
Southern Express Co.	32,195[8]	791	1,047,845	1,070,960	531,391	539,569	15,554	7,707	422,283	66,202	511,746	27,823	13,482	14,341	—23,056
United States Express Co.	28,883[9]	4,035	1,769,653	1,796,269	855,096	941,173	41,033	16,537	816,409	50,617	924,596	16,577	13,062	3,515	—112
Wells, Fargo & Co.	64,486[10]	25,825	2,881,799	2,931,830	1,416,675	1,515,155	70,145	34,586	1,144,260	80,334	1,329,325	185,830	30,000	155,830	—82,753
Western Express Co.	4,888[11]	12	128,080	130,360	66,751	63,609	460	981	43,412	2,863	47,716	15,893	936	14,957	14,642

TWO MONTHS OF FISCAL YEAR, 1913.

Name of Company.	Miles of line covered. Steam roads.	Other lines.	Express revenue.	Gross receipts from operation.	Less express privileges. Dr.	Total operating revenues.	Operating expenses. Maintenance.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit —).	Taxes.	Operating income (or loss —).	Increase or decr. (—) comp. with last year.
Adams Express Co.	32,578[1]	4,786	$5,572,560	$5,643,529	$2,805,836	$2,842,693	$140,254	$21,030	$2,219,576	$170,778	$2,551,638	$291,055	$33,268	$257,787	$234,652
American Express Co.	57,337[2]	3,467	7,487,834	7,816,508	3,720,045	4,096,463	123,542	72,258	3,252,962	316,494	3,765,256	331,207	62,103	269,104	44,977
Canadian Express Co.	6,559[3]	847	563,817	576,799	273,744	303,055	5,585	2,148	231,756	14,812	254,301	48,754	5,500	43,254	—11,226
Canadian Northern Express Co.	4,344[4]	22	114,876	118,360	45,950	72,410	669	610	35,012	3,100	39,391	33,019	807	32,212	9,328
Globe Express Co.	2,863[5]	...	170,651	172,928	85,717	87,211	1,873	3,387	51,891	8,178	65,329	21,882	1,600	20,282	7,539
Great Northern Express Co.	8,647[6]	405	655,386	663,022	397,190	265,832	3,287	4,925	153,864	8,956	171,032	94,800	9,759	85,041	40,543
Northern Express Co.	7,457[7]	277	641,729	648,553	345,732	302,821	2,968	6,339	169,532	13,534	192,373	110,448	9,000	101,448	31,695
Southern Express Co.	32,195[8]	791	2,194,281	2,240,088	1,110,255	1,129,833	31,530	16,646	848,132	127,178	1,023,486	106,347	26,799	79,548	3,297
United States Express Co.	28,883[9]	4,035	3,533,496	3,586,358	1,743,632	1,842,726	81,734	28,268	1,646,958	100,877	1,857,837	—15,111	23,275	—38,386	—41,583
Wells, Fargo & Co.	64,486[10]	25,825	5,812,105	5,908,254	2,873,391	3,034,863	131,983	67,221	2,268,174	164,962	2,632,340	402,523	60,000	342,523	10,872
Western Express Co.	4,888[11]	12	251,361	255,878	131,664	124,214	1,213	1,959	85,138	5,679	93,989	30,225	1,912	28,313	30,612

Operated in previous periods: Steam roads—[1] 32,945; [2] 54,325; [3] 6,400; [4] 3,370; [5] 2,904; [6] 8,466; [7] 7,310; [8] 31,818; [9] 28,965; [10] 63,441; [11] 4,843. Other Lines—[1] 4,707; [2] 2,561; [3] 830; [6] 339; [7] 315; [8] 846; [9] 3,965; [10] 17,314; [11] 8.
*Merged with American Express on July 1, 1912.

Reparation Awarded.

George A. Hornel & Company v. Chicago, Milwaukee & St. Paul et al. Opinion by Commissioner McChord:

The commission found that the rate of 20 cents per 100 lbs. for the transportation of fresh meat and packing house products from Austin, Minn., to Chicago was unreasonable to the extent that it exceeded 18.5 cents per 100 lbs. for the transportation of fresh meat between the two points in question, and 16.5 per 100 lbs. for the transportation of packing house products. (26 I. C. C., 112.)

J. J. Newman Lumber Company v. Mississippi Central Railroad et al. Opinion by the commission:

The complainant alleges misrouting by defendant and consequent exaction of excessive charges for the transportation of 12 cars of yellow pine lumber from McCallum and Sumrall, Miss., to St. Albans, Vt., thence reconsigned to Worcester and Fitchburg, Mass., and Willimantic, Conn. The commission found that the New Orleans & Northeastern negligently routed these shipments via a route other than the cheapest available route and so deprived the complainant of the privilege of reconsignment at the joint through rate of 37 cents per 100 lbs. to Worcester, Fitchburg and Willimantic. (26 I. C. C., 97.)

C. M. Papillo v. Atlanta & West Point et al. Opinion by the commission:

The complainant contends that the rate of 93 cents per 100 lbs. for the transportation of household goods in carloads from West Point, Ga., to Waco, Tex., is unreasonable. Reparation is sought. The rate in question is not a through rate but is based on the lowest combination. The complainant called attention to the rate of 77 cents per 100 lbs. on household goods from points east of Chicago and north of the Ohio river to California and Nevada points, and also showed that the rates from West Point to Waco were lower on vehicles, furniture, cooperage, vegetables, etc., than applied on household goods. The commission found that the present rate is unreasonable to the extent that it exceeds 77 cents per 100 lbs. (26 I. C. C., 65.)

Rates on Canteloupes and Potatoes Increased.

In re investigation and suspension of advances in rates by carriers for the transportation of canteloupes, potatoes and other fruits and vegetables from Ruston, La., and other points to Chicago and other points. Opinion by Commissioner McChord:

The defendants showed that the present rate arrangement had been reached in haphazard manner and that it needed readjustment. The commission decided that the proposed increases are reasonable. The order of suspension was vacated. (26 I. C. C., 101.)

Sugar Rate Reduced.

W. J. Echols & Company et al. v. Atchison, Topeka & Santa Fe et al. Opinion by the commission:

The complainant contends that the carload rates on sugar via sea-and-rail route from points in Atlantic seaboard territory to Fort Smith, Ark., are unreasonable. These rates vary from 45 to 50 cents per 100 lbs. The commission found that these rates were unreasonable and prescribed lower rates for the future. The new rates are in each case six cents lower than the rates now in effect. (26 I. C. C., 110.)

Pulp Wood Rates Reduced.

Rhinelander Paper Company v. Minneapolis, St. Paul & Sault Ste. Marie. Opinion by the commission:

The complainant contends that the rate of 6 cents per 100 lbs. for the transportation of pulp wood in carloads from Trenary, Delta Junction and Manistique, Mich., to Rhinelander, Wis., and the rate of 7½ cents per 100 lbs. for the transportation of pulp wood in carloads from Whitedale, Bovee and Christiansen Spur, Mich., to Rhinelander are unreasonable. The complainant contends that as Ladysmith, a point 87 miles west of Rhinelander, enjoys a differential of one cent under Rhinelander on movements from Minnesota, Rhinelander should be accorded an equal differential under Ladysmith on movements from Michigan. The defendants concede that Rhinelander is entitled to a differential of one cent under Ladysmith on traffic from Michigan points and have recently published tariffs naming the same rate of 6 cents per 100 lbs. from the first three stations, but reducing the rate of 7½ cents per 100 lbs. from the latter three stations to 6½ cents per 100 lbs. and making the rate to Ladysmith from all these stations a differential of one cent higher than to Rhinelander. The commission found that the rates now in effect are not unreasonable. Reparation was awarded on shipments which moved from the latter three stations under the rate of 7½ cents per 100 lbs. (26 I. C. C., 104.)

Common Brick Rates Not Advanced.

In re investigation and suspension of advances in rates by carriers for the transportation of building brick and other articles in carloads from Orchard Park and Jewettville, N. Y., to Canadian points. Opinion by Commissioner McChord:

The advances complained of in the tariff average about 35 cents per ton and in some cases are as high as 65 cents per ton. The defendants contended that the commission in the *Stowe Fuller case*, 12 I. C. C., 213, ruled that all classes of brick should take the same rate. The commission declared, however, that that case did not relate to common brick and that common brick should enjoy a lower rate than paving and fire brick. The commission decided that the defendants did not show that the proposed increases were reasonable and ordered them to withdraw the suspended tariffs. (26 I. C. C., 129.)

Mixed Carload Rate.

West Point Manufacturing Company v. Chattahooche Valley et al. Opinion by the commission:

The complainant contends that the provision of the defendant's tariff governing the shipment of cotton duck and denims from southeastern territory to Pacific coast terminals is unreasonable, in that it prohibits the shipment of mixed carloads of cotton duck and denims with cotton sheeting, drills and bagging. The commission found that all these goods were shipped in the same kind of packages and that duck and drills weighed about the same to the carload and took the same rates. The commission decided that the rule in question was unreasonable insofar as it deals with mixed carloads of duck and drills, and ordered that in future the rate on mixed carloads of cotton duck and cotton drills should be the carload rate. Reparation was awarded. (26 I. C. C., 79.)

STATE COMMISSIONS.

Myer Hurley, a member of the Public Utilities Commission of Kansas, is general chairman of the Brotherhood of Locomotive Engineers for the Atchison, Topeka & Santa Fe, a position which he has held for fourteen years. The *Santa Fe Magazine* for February contains a portrait of Hurley. He was appointed commissioner January 23, last. For six years Mr. Hurley was chairman of the board of trustees of the grand lodge of his brotherhood. He began railway service in 1879 as a fireman on the Louisville & Nashville, and has been on the Santa Fe 25 years.

COURT NEWS.

In the federal court at Trenton, N. J., February 14, the government filed a suit against the Delaware, Lackawanna & Western Railroad and the Delaware, Lackawanna & Western Coal Company, charging violation of the anti-trust law in the agreement between the two defendants for marketing coal. The government charges that the railroad by its great facilities, resources and power is able to buy so much of the coal produced by independent operators that it can control the price of more than 90 per cent. of the entire production along its lines, so that at non-competing points it can arbitrarily fix the price of all anthracite coal. The business of the railroad is declared to have been immensely profitable, the majority of the stock of the company being held, in large blocks, by less than twenty-five individuals. A still smaller number of men dominates its affairs by their unity of purpose and effort.

The suit will be of interest to all anthracite roads. Besides the Lackawanna, the Lehigh Valley has organized and distributed the stock of a coal sales company in the same way. The Delaware & Hudson sells its coal to the Hudson Coal Company, but the stock of the latter is owned by the D. & H. The Reading is believed to be liable to attack by the government under both the Sherman law and the commodities clause of the Interstate Commerce law.

Railway Officers.

Executive, Financial and Legal Officers.

James Imbrie, vice-president of the Brinson Railway, with office at New York, has been elected chairman of the board and John H. Hunter has been elected vice-president. The general offices will be transferred from Springfield, Ga., to Savannah.

Operating Officers.

G. B. Perdue has been appointed trainmaster of districts 27 and 28 of the Grand Trunk, with headquarters at Durand, Mich.

A. Syverson has been appointed superintendent of the Ann Arbor, with office at Owosso, Mich., to succeed W. D. Holliday, resigned; effective February 14.

A. B. Warner has been appointed superintendent of the Chicago, Rock Island & Gulf, with headquarters at Ft. Worth, Tex., succeeding C. L. Ruppert.

John W. Walters has been appointed trainmaster and roadmaster of the St. Louis, Brownsville & Mexico, with office at Kingsville, Tex., succeeding E. S. Heyser, resigned.

J. H. Reich, car accountant of the New Orleans, Texas & Mexico, has been appointed superintendent of that road, and the St. Louis, Brownsville & Mexico, with headquarters at Houston, Tex.

C. J. Wilson has been appointed superintendent of the Duluth, Winnipeg & Pacific, with headquarters at Virginia, Minn., to succeed C. W. Houston, resigned to engage in private business.

E. S. Heyser, trainmaster and roadmaster of the St. Louis, Brownsville & Mexico, has been appointed general superintendent of the San Benito & Rio Grande Valley, with headquarters at San Benito, Tex.

S. P. Coughlin has been appointed assistant superintendent of the Houston East & West Texas and the Houston & Shreveport, with headquarters at Houston, Tex., succeeding H. J. Micksch, transferred.

G. C. Randall has been appointed superintendent of transportation of the Colorado & Southern, in charge of freight and passenger train movements, car distribution and assignment of locomotives, with headquarters at Denver, Colo.

C. L. Ruppert, superintendent of the Chicago, Rock Island & Gulf at Ft. Worth, Tex., has been appointed superintendent of the Oklahoma division of the Chicago, Rock Island & Pacific, with office at El Reno, Okla., in place of J. McGie, deceased.

F. M. Conner, assistant trainmaster of the Cincinnati, Hamilton & Dayton, at Hume, Ill., has been appointed trainmaster, with headquarters at Indianapolis, Ind., succeeding E. W. Hoffman, promoted, and C. W. Havens succeeds Mr. Conner.

J. A. Sormerville, superintendent of terminals of the Missouri Pacific at Kansas City, Mo., has been appointed superintendent of transportation of that road and the St. Louis, Iron Mountain & Southern, with headquarters at St. Louis, Mo. He succeeds E. F. Kearney, who recently was made general superintendent of transportation of the Missouri Pacific system.

J. P. Burrus, superintendent of the Fort Worth division of the International & Great Northern, at Mart, Tex., has been appointed superintendent of the Gulf division, including Taylor sub-division, with headquarters at Palestine, succeeding T. C Radey, resigned; and S. E. Burkhead, inspector of transportation and stations of the Texas & Pacific, has been appointed superintendent of the Fort Worth division of the International & Great Northern, with headquarters at Mart, succeeding Mr. Burrus.

C. E. Hix, car accountant of the Seaboard Air Line at Portsmouth, Va., has been appointed to the new position of superintendent of transportation. The assistant general manager will in future have jurisdiction over the maintenance of way, operating and telegraph departments, and the following officers will report to and receive instructions from him: Engineer maintenance of way, superintendent of transportation, superintendent of telegraph, car accountant, fuel inspector and division superintendents on all except maintenance of way matters, upon which they will report to the engineer maintenance of way.

Frederick H. Hammill, division superintendent of the Chicago & North Western at Boone, Iowa, has been appointed assistant general superintendent, with office at Boone, with jurisdiction over the East Iowa, West Iowa, Iowa & Minnesota, Northern Iowa and Sioux City divisions. F. J. Byington, assistant division superintendent at Baraboo, Wis., has been appointed superintendent of the West Iowa division, with headquarters at Boone, Ia., in place of Mr. Hammill. J. W. Layden, trainmaster at Baraboo, succeeds Mr. Byington as assistant superintendent of that place. J. H. Hull succeeds Mr. Layden as trainmaster. J. S. Rice has been appointed trainmaster of the East Iowa division at Belle Plaine, Iowa, in place of A. Syverson, resigned.

John A. Shepherd, whose appointment as superintendent of terminals of the Missouri Pacific at Kansas City, Mo., has been announced in these columns, was born April 21, 1874, at Homer, Ill. He was educated in the common schools and began railway work in September, 1893, as a telegraph operator for the Wabash, remaining with that road for ten years as train despatcher and chief despatcher. He was then until October, 1905, assistant superintendent for the Terminal Railroad Association of St. Louis, in charge of freight movement. On the latter date Mr. Shepherd became superintendent of the Western Maryland, with headquarters at Hagerstown, Md., and in May, 1911, he was promoted to general manager, with office at Baltimore, Md., which position he held until February 1 this year, when he was appointed superintendent of terminals of the Missouri Pacific, as noted above.

W. A. Cooper, whose appointment as manager of sleeping, dining and parlor car and news service of the Canadian Pacific, with office at Montreal, Que., has been announced in these columns, was born on March 22, 1871, at Montreal. He began railway work in February, 1886, as secretary to assistant general manager of the Grand Trunk, and in June, 1891, was appointed chief clerk in the office of the general superintendent of the Eastern division of the Canadian Pacific. Three years later he was made inspector of sleeping, dining and parlor cars and news service of the Canadian Pacific, and in July, 1897, was made assistant superintendent of the same department. In December, 1905, he was promoted to superintendent, and in August, 1908, became general superintendent, which position he held at the time of his recent appointment as manager of the same department, as above noted.

Stanley Saunders Russell, whose appointment as general superintendent of transportation of the Central Vermont, with headquarters at St. Albans, Vt., has been announced in these columns, was born on October 18, 1874, at Rednersville, Ont., and was educated in the public schools and at Belleville College. He began railway work in November, 1891, in the office of the assistant superintendent of the Grand Trunk at Belleville, and the following year was transferred to Toronto. In August, 1896, he was appointed secretary to the superintendent at Toronto, and in March, 1898, he became chief clerk to the joint superintendent of the Grand Trunk and the Wabash at St. Thomas. From June to December, 1902, he was private secretary to the vice-president and general manager of the Central Vermont at St. Albans, and from January, 1903, to December of the following year was chief clerk to the superintendent of transportation, and then became chief clerk to the general manager. In October, 1911, he was made

S. S. Russell.

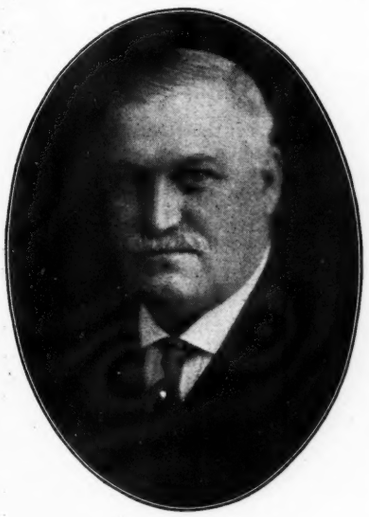
superintendent of car service, which position he held at the time of his recent appointment as general superintendent of transportation of the same road, as above noted.

Clinton Lloyd Bardo, assistant to general manager of the Lehigh Valley, at South Bethlehem, Pa., has been appointed general manager of the New York, New Haven & Hartford, with headquarters at New Haven, Conn., succeeding B. R. Pollock, resigned. Mr. Bardo was born at Montgomery, Pa., in 1867, and began railway work in 1885 as an operator on the Pennsylvania Railroad. The next year he worked as operator on the Philadelphia & Reading and then went to the Tidewater Oil Co. as operator and supply agent in the construction department at Mauch Chunk, Pa. In 1887 he went to the Lehigh Valley as operator, and was later made train despatcher. In 1892 he was appointed assistant trainmaster of the Wyoming division and after a few months was made trainmaster of that division. He was transferred to the New York division in 1901, and in 1904 went to the New York, New Haven & Hartford as freight trainmaster of the New York division. He was appointed assistant superintendent of this division in 1905, and on June 1, 1907, was appointed superintendent of the Grand Central Station and Electric division of the New York Central & Hudson River, leaving that road on March 15, 1911, to become assistant to general manager of the Lehigh Valley, with headquarters at South Bethlehem, Pa., which position he held at the time of his recent appointment as general manager of the New York, New Haven & Hartford, as above noted. Mr. Bardo has been appointed also general manager of the Central New England.

S. E. Burkhead, who has been appointed superintendent of the Fort Worth division of the International & Great Northern, with headquarters at Mart, Tex., was born on July 24, 1873, at Sparta, Tenn., and was educated at Southwestern University, Georgetown, Tex. He began railway work with the International & Great Northern on May 15, 1889, as machinist apprentice, and remained in the service of that company until December, 1909, holding the positions of locomotive fireman, locomotive engineman, inspector of transportation for the entire line, assistant superintendent, Gulf division, and chairman of the rule committee introducing the rules of the American Railway Association. From December, 1909, to September, 1911, he was with the Denver & Rio Grande, first as assistant superintendent of the First division Colorado lines, and then as superintendent of the Salt Lake division, Utah lines. In December, 1911, he went to the Texas & Pacific as trainmaster, Eastern division, and was later chairman of the rule committee, introducing the rules of the American Railway Association, and then superintendent of terminals at Fort Worth, Tex., until his appointment as inspector of transportation and stations of the same road, which position he held at the time of his recent appointment as superintendent of the Forth Worth division of the International & Great Northern, as above noted.

S. E. Burkhead.

F. M. Melin, division superintendent of the Chicago, Milwaukee & St. Paul at Milwaukee, Wis., has been transferred to Aberdeen, S. D., as superintendent of the Hastings & Dakota division, succeeding J. T. Gillick, promoted. J. M. Oxley, division superintendent at Chicago, has been appointed division superintendent, with headquarters at Ottumwa, Iowa, in place of J. A. MacDonald, who has been appointed superintendent of the Northern and LaCrosse divisions, with headquarters at Milwaukee, succeeding Mr. Melin. E. W. Morrison, assistant division superintendent at Milwaukee, succeeds Mr. Oxley as superintendent of the Chicago division. N. P. Thurber has been appointed assistant superintendent of the Prairie du Chien and Mineral Point divisions, with office at Milwaukee. W. B. Foster, superintendent at Tacoma, Wash., has been appointed general superintendent of the Puget Sound lines, with headquarters at Seattle, Wash. P. C. Hart, who formerly was general superintendent of the Chicago, Milwaukee & Puget Sound, and who recently was promoted to general manager of the Chicago, Milwaukee & St. Paul lines east of the Missouri river, with headquarters at Chicago, has been in the service of the St. Paul road since 1876. He began railway work as section man, and has since filled the positions of telegraph operator, station agent, brakeman, conductor, chief clerk in the superintendent's office, trainmaster, superintendent of terminals, division superintendent, superintendent of construction, and general superintendent, until his recent promotion as general manager on February 1. J. T. Gillick, whose appointment as assistant to the general manager, with office at Chicago, has already been announced, was born in June, 1870, at Glencoe, Minn. He began railway work in 1884 with the Chicago, Milwaukee & St. Paul, and has been successively telegraph operator, train despatcher, trainmaster and division superintendent.



P. C. Hart.

Traffic Officers.

John Gray has been appointed a freight agent of the Grand Trunk, with office at Toronto, Ont.

J. B. DeCamara has been appointed commercial agent of the International & Great Northern, with office at Laredo, Tex.

F. Duval Armstrong has been appointed general agent of the Frisco Lines at New Orleans, La., succeeding I. T. Preston, deceased.

C. H. Pearson has been appointed assistant general freight agent of the Alabama Great Southern, with headquarters at Birmingham, Ala.

J. T. Baird has been appointed commercial agent of the Central of Georgia, with office at Oklahoma City, Okla., succeeding Tinsley Smith, transferred.

J. O. Goodsell, traveling passenger agent of the Union Pacific, with headquarters at Detroit, Mich., has been appointed city passenger agent at Chicago.

Gordon Edwards has been appointed traveling freight agent of the Delaware & Hudson Company, with office at Pittsburgh, Pa., succeeding F. C. Snyder, deceased.

W. F. Freeman has been appointed soliciting freight agent of the Georgia Southern & Florida, with office at Atlanta, Ga., succeeding W. B. Butler, resigned.

E. L. Kemp, assistant superintendent of the Illinois Central at Louisville, Ky., has been appointed local freight agent at Chicago, succeeding L. F. Barron, resigned.

L. K. Bemis has been appointed traveling freight and passenger agent of the Illinois Central, with headquarters at Salt Lake City, Utah, succeeding R. E. Watson, resigned.

J. A. Sullivan, local freight agent of the Wabash at Detroit, Mich., has been appointed division freight agent, with office at Detroit, succeeding E. H. B. Cull, deceased. Effective February 15.

Joseph L. Sheppard has been appointed assistant general freight agent of the Illinois Central and the Yazoo & Missis-

sippi Valley, with headquarters at Memphis, Tenn., to succeed Fred H. Law, transferred.

F. W. Robinson, assistant to director of traffic on the Harriman Lines, with office at Chicago, has been appointed assistant traffic manager of the Oregon-Washington Railroad & Navigation Company, with headquarters at Portland, Oregon.

Fred H. Law, assistant general freight agent of the Illinois Central and Yazoo & Mississippi Valley, at Memphis, Tenn., has been appointed assistant general freight agent, with headquarters at St. Louis, Mo., succeeding J. S. Weitzell, who has been granted leave of absence on account of ill health.

E. S. Johnson, commercial agent of the Macon, Dublin & Savannah, at Miami, Fla., has been appointed commercial agent, with office at Jacksonville, succeeding M. H. Dorsett, resigned to accept service with another company. W. F. Mundee has been appointed contracting freight agent, at Jacksonville. The office of commercial agent at Miami has been abolished, but the commercial agent at Jacksonville will have an office in Miami during the perishable season.

Edward Emery, traveling passenger agent of the Baltimore & Ohio at Denver, Colo., has been appointed traveling agent of the passenger department, with headquarters at Baltimore, Md., and he will now be an inspector of passenger service. He will inspect and report on passenger and ticket offices, station buildings and train service, as well as the prompt and careful handling of baggage. He will inculcate ideas as to neatness, and as to alertness to the interests of travelers and in presenting the advantages of the Baltimore & Ohio. Mr. Emery entered Baltimore & Ohio service in the baggage department at Pittsburgh in October, 1903, and was later advanced to ticket clerk and city ticket agent there.

In addition to the representatives local to the Union Pacific, Oregon Short Line and Oregon-Washington Railroad & Navigation Company, comprising the Union Pacific System, the following will solely represent Union Pacific System Lines: Willard Massey, New England freight and passenger agent, Boston, Mass.; E. A. Shewe, general agent, Butte, Mont.; W. H. Connor, general agent at Cincinnati, Ohio, and Cleveland; J. W. Turtle, traveling passenger agent, Des Moines, Ia.; J. C. Ferguson, general agent at Detroit, Mich.; H. O. Wilson, general agent at Los Angeles, Cal.; L. L. Davis, commercial agent, Milwaukee, Wis.; H. F. Carter, district passenger agent, and D. M. Collins, district freight agent, both with headquarters at Minneapolis, Minn.; J. B. DeFriest, general eastern agent at New York City; H. V. Blasdel, agent of the passenger department, and A. V. Stevenson, agent of the freight department, both with headquarters at Oakland, Cal.; J. C. Percival, agent at Olympia, Wash.; S. C. Milbourne, general agent at Philadelphia, Pa.; J. E. Corfield, general agent at Pittsburgh, Pa.; L. M. Tudor, commerical agent, Pueblo, Colo.; B. F. Owlsey, agent at Port Townsend, Wash.; A. J. Dutcher, general agent at St. Louis, Mo.; James Warrack, district freight and passenger agent, Sacramento, Cal.; S. F. Booth, general agent at San Francisco, Cal.; F. W. Angier, agent of the passenger department, and L. M. Cheshire, agent of the freight department, both with headquarters at San Jose, Cal.; J. B. Courtright, traveling freight and passenger agent, Vancouver, B. C.; W. C. Knowles, traveling passenger agent, with headquarters at Cincinnati, in place of W. T. Holly, resigned, to go with another company.

Engineering and Rolling Stock Officers.

J. V. Murphy has been appointed roadmaster of the Houston & Texas Central at Ennis, Tex., in place of L. Acker, resigned.

C. R. Diemar has been appointed assistant engineer of the Baltimore & Ohio Southwestern, with office at Cincinnati, Ohio.

H. H. Gibson has been appointed chief engineer of the New Orleans Southern & Grand Isle, with headquarters at Algiers, La.

F. E. Watson has been appointed division engineer of the Chicago, Rock Island & Pacific at Trenton, Mo., succeeding R. Johnson.

Watson Townsend has resigned as assistant engineer of the Union Pacific, with headquarters at Omaha, Neb., to accept the position of city engineer of Omaha.

R. C. Hyde has been appointed master mechanic of the Louisiana division of the Chicago, Rock Island & Pacific, with headquarters at El Dorado, Ark., succeeding H. J. Osborne, resigned.

J. G. Sheldrick, resident engineer of the Minneapolis, St. Paul & Sault Ste. Marie at Superior, Wis., has been appointed division engineer of the Superior-Duluth division, with headquarters at Superior.

H. H. Eggleston, assistant supervisor of bridges and buildings of the Baltimore & Ohio Chicago Terminal at Chicago, has been appointed supervisor of bridges and buildings of the Chicago Great Western at Des Moines, Iowa.

A. H. Hogeland, chief engineer of the Great Northern, has been appointed consulting engineer, with headquarters at St. Paul, Minn. R. Budd, assistant to the president, succeeds Mr. Hogeland as chief engineer, with office at St. Paul.

T. A. Summerskill has been appointed superintendent of motive power of the Central Vermont, with office at St. Albans, Vt.; and J. E. Fitzsimons, acting superintendent of motive power, at St. Albans, has been appointed master mechanic, with office at St. Albans.

H. E. Smith has been appointed general signal foreman of the terminals of the Louisville & Nashville and the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., succeeding J. H. Clark, signal inspector, resigned, and the office of signal inspector is abolished.

H. R. Carpenter, assistant engineer of the Missouri Pacific at St. Louis, Mo., has been appointed engineering maintenance of way, with headquarters at St. Louis, Mo. F. K. Bennett, assistant engineer at St. Louis, has been transferred to Kansas City, Mo., in a similar capacity.

The office of chief enginer of the Kansas City, Mexico & Orient, formerly held by W. W. Colpitts, has been abolished. H. B. Holmes has been appointed resident engineer, with headquarters at Kansas City, Mo., and will have jurisdiction over matters pertaining to the engineering department.

B. R. Kulp has been appointed acting division engineer of the Chicago & North Western at Antigo, Wis., succeeding W. J. Jackson, who has been transferred to Madison, Wis., as division engineer in place of S. S. Long, who succeeds W. T. Main as division engineer at Chicago. Mr. Main will engage in private business.

P. D. Galarneau, superintendent of the St. Louis, Mo., shops of the Armour Car Lines, has been transferred to Meridian, Miss., in charge of the shops, also of the New Orleans and Mobile repair forces, succeeding A. B. Chadwick, resigned. C. H. Taylor, superintendent of the South Omaha, Neb., shops, succeeds Mr. Galarneau, and J. C. Rowe succeeds Mr. Taylor.

W. E. Anderson, master mechanic of the Colorado & Southern at Trinidad, Colo., has been transferred to Denver, Colo., as master mechanic of that road and the Atchison, Topeka & Santa Fe, succeeding H. W. Ridgway, who has been appointed superintendent of motive power, with office at Denver, Col., in place of H. C. Van Buskirk, who has resigned on account of ill health. J. M. Davis succeeds Mr. Anderson as master mechanic at Trinidad.

F. P. Sisson, resident engineer of the Grand Trunk at Detroit, Mich., has been appointed assistant engineer, and H. G. Batten has been appointed supervisor of bridges and buildings, both with headquarters at Detroit. O. H. Sessions has been appointed assistant engineer and G. Sanders has been appointed supervisor of bridges and buildings, both with headquarters at Battle Creek. The position of roadmaster having been abolished, the following now have the title of supervisor of track: H. Plowman, at Milwaukee Junction, Mich.; J. Mullen, Durand; J. Lockert, Grand Rapids; C. Hawkins, Pontiac; J. Nolan, Valparaiso, Ind.; J. Cotter, Battle Creek, Mich., and F. Tranzow, at Durand.

F. T. Chase, who recently was appointed master mechanic of the Missouri, Kansas & Texas Railway of Texas, with headquarters at Smithville, Tex., was born at Atlanta, Ga., August 25, 1862. He was educated in the common schools, and after serving an apprenticeship as millwright and machinist, began railway work in October, 1881, as a locomotive fireman on the Texas & Pacific. From April, 1882, to September, 1887, he was

engaged in other business, on the latter date re-entering service as a machinist for the Missouri, Kansas & Texas of Texas. He was a locomotive engineer on that road for ten years from August, 1889, and a locomotive fireman from May, 1899, to August, 1900. He was then promoted to foreman of machinery at Smithville, Tex., which position he held until his appointment as master mechanic, as noted above.

William Garstang, superintendent of motive power and master car builder of the Cleveland, Cincinnati, Chicago & St. Louis, the Peoria & Eastern and the Cincinnati Northern, having requested to be relieved of a portion of his duties, has been appointed general master car builder, and S. K. Dickerson, formerly assistant superintendent of motive power of the Lake Shore & Michigan Southern, has been appointed superintendent of motive power, both with headquarters at Indianapolis, Ind. Mr. Garstang was born February 28, 1851, in England, and was educated in the public schools. He began railway work in 1863 as a machinist apprentice with the Cleveland & Erie, now the Lake Shore & Michigan Southern, at Cleveland, Ohio, where he remained six years. He was then for 11 years machinist and general foreman for the Atlantic & Great Western and the New York, Pennsylvania & Ohio; three years general foreman of the Cleveland & Pittsburgh division of the Pennsylvania Company; five years master mechanic of the Cleveland, Columbus, Cincinnati & Indianapolis, now the Cleveland, Cincinnati, Chicago & St. Louis. From 1888 to April, 1893, Mr. Garstang was superintendent of motive power of the Chesapeake & Ohio, and on the latter date became superintendent of motive power of the Cleveland, Cincinnati, Chicago & St. Louis.

W. Garstang.

Purchasing Officers.

Joseph J. Bennett has been appointed assistant purchasing agent of the Illinois Central, with headquarters at Chicago.

T. J. Lowe has been appointed fuel agent of the Canadian Northern and the Duluth, Winnipeg & Pacific, with headquarters at Winnipeg, Man.

Special Officers.

G. S. Ward has been appointed chief special agent of the Seaboard Air Line, effective March 1.

W. B. Wells, commercial agent of the Frisco Lines at Dallas, Tex., has been appointed industrial agent, with headquarters at St. Louis, Mo. E. F. Hundley succeeds Mr. Wells.

George K. Andrews has been appointed commissioner of agriculture, with supervision over the lines of the Missouri Pacific, with headquarters at St. Louis, Mo. L. A. Markham, commissioner of agriculture for the entire system, with headquarters at Little Rock, Ark., will hereafter have jurisdiction over the St. Louis, Iron Mountain & Southern only, and will retain his headquarters at Little Rock.

OBITUARY.

Robert Law, formerly for many years connected with the Burlington system, and afterwards vice-president and general manager of the Colorado & Northwestern, died on February 7, at Los Angeles, Cal., aged 61 years.

George Copland, vice-president, secretary-treasurer and auditor of the Lexington & Eastern, with headquarters at Lexington, Ky., died at that place on February 11. He was born on November 13, 1837, in Aberdeenshire, Scotland, and had been in the service of the Lexington & Eastern since 1894.

William Randall, auditor of freight and ticket accounts of the Chicago, Burlington & Quincy, with headquarters at Omaha, Neb., died in that city on February 7, at the age of 71 years. Mr. Randall had been in the service of the Burlington system since 1872, and had been auditor of freight and ticket accounts since 1875.

William Riley McKeen, who was president of the Terre Haute & Indianapolis, now the Vandalia, from 1867 to January 15, 1896, died at Terre Haute, Ind., on February 18. Mr. McKeen was born on October 12, 1829, in Vigo County, Ind. He was the father of Benjamin McKeen, general manager of the Pennsylvania Lines west of Pittsburgh, and of W. R. McKeen, Jr., consulting engineer of motor cars on the Union Pacific.

Albert S. Cheever, who was superintendent of the Fitchburg division of the Boston & Maine from November, 1902, for ten years, died on February 17, at his home in Somerville, Mass. He was born on September 17, 1857, at Chelsea, Mass., and began railway work as a clerk in the general superintendent's office of the Fitchburg Railroad, now a part of the Boston & Maine. After holding various subordinate positions in the chief engineer's office, he became assistant engineer, with headquarters at Fitchburg, and in May, 1887, was made division engineer in charge of the Western division of the same road. From November, 1890, to September, 1897, and from December, 1898, to July, 1900, he was chief engineer of the Fitchburg, and then until November, 1902, was assistant chief engineer of the Boston & Maine. He was appointed superintendent of the Fitchburg division of the same road in November, 1902, remaining in that position until November 17, 1912, when he was assigned to special work in the operating department.

NEW LINES FOR ARGENTINA.—The Buenos Ayres Great Southern Railway, already the longest system in Argentina, has outlined a comprehensive construction program for the year 1913. The principal undertaking is the new connection with Chile. This line has now been opened to traffic as far as Sennilosa, about 20 miles west of Neuquen, and about 180 miles from the Chilean border. The company will at once proceed with the remaining section. This will enter the Cordilléras, and an immense amount of rock blasting will have to be undertaken. Twenty tons of dynamite have already been sent to the spot where the blasting is to begin, while the staff of laborers has been materially increased, the contractors recognizing that they have before them one of the most difficult, as well as the most costly portions of the work. The company will also commence the construction of the branch line from Alvarez Jonte to Lezama. Other branch lines to be taken in hand within the course of the next few months will include one from San Vicente to Villanuéva and another from Darwin to Conésa.

RAILWAY DEVELOPMENT IN ROUMANIA.—The project to grant a large credit to the railway authorities continues to be discussed and it is thought that the government will advocate such action soon after parliament reassembles, although only a part of what is wanted may be granted. The director general of railways has now made a report in which he urges the opening of the following credits: For the development of the system (new lines and new facilities), $25,600,000; for construction of a central station in Bucharest, $5,000,000; for improvement (double tracking, etc.) of existing lines, $1,400,000; making a total of $32,000,000. If these credits should be granted the expenses already incurred in the construction of various new lines would be liquidated at first, and other new lines would then be built. It is thought probable that one of the first lines to be built would be a double-track road from Bucharest to Craiova via Rosiori and Caracal, of which the estimated cost is $13,125,000. Other lines which would probably be among the first are those which would connect Bucharest with Jassy via Urziceni, Faurei, and Tecuci, and Jassy with Burdujeni via Harlau and Botoshani. The eventual construction is also contemplated of a number of strategic lines in Moldavia, the narrow spur of Roumania running to the north between Austria-Hungary and Russia, as well as the development of the urban system in and around Bucharest.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Norfolk & Western is in the market for 60 locomotives.

The Baltimore & Ohio is considering the purchase of a large number of locomotives.

The Ocean Shore has ordered 2 mogul locomotives from the Baldwin Locomotive Works.

The Chicago & Western Indiana is in the market for five additional switching locomotives.

The Virginia & Rainy Lake has ordered 2 consolidation locomotives from the Baldwin Locomotive Works.

The Atlantic Coast Line has ordered 4 six-wheel switching locomotives from the Baldwin Locomotive Works.

The Chicago, Burlington & Quincy has ordered 25 switching locomotives from the Baldwin Locomotive Works.

The Federal Furnace Company has ordered 1 six-wheel switching locomotive from the Baldwin Locomotive Works.

Guinle & Company, New York, have ordered 1 four-wheel switching locomotive from the American Locomotive Company.

The Pennsylvania Lines West have ordered 70 additional consolidation locomotives from the American Locomotive Company. These locomotives will be equipped with superheaters, will have 26 in. x 28 in. cylinders, 62 in. driving wheels and in working order will weigh 254,000 lbs.

CAR BUILDING.

The Norfolk & Western is negotiating for an additional 2,000 freight cars.

The Utah Railway, Salt Lake City, Utah, is said to be figuring on 500 coal cars.

The Toledo, St. Louis & Western is considering the purchase of 1,000 box cars.

The Atlantic Coast Line has ordered 1,000 box cars and 300 flat cars from the Barney & Smith Car Company.

The Berwind-White Coal Mining Company, New York, has ordered 100 gondola cars from the Cambria Steel Company.

The Harriman Lines, instead of having ordered 2,000 gondola cars from the Pressed Steel Car Company and 800 automobile cars, 10 cabooses and some box cars from the Standard Steel Car Company, as mentioned in the *Railway Age Gazette* of February 14, have ordered cars from those two companies as follows: 2,280 drop bottom gondola cars, 200 hopper bottom gondola cars and 203 tank cars from the Pressed Steel Car Company; 1,000 box cars, 800 automobile cars and 110 caboose cars from the Standard Steel Car Company. This company has also ordered 2,290 box cars from the American Car & Foundry.

IRON AND STEEL.

General Conditions in Steel.—The volume of orders in the steel industry has shown a further falling off during the past week. This is partly due to the threatened strike of the firemen and partly to the fact that the change of administration is now near at hand. Production continues at the same high rate and prices are still firm. It is expected that the unfilled tonnage at the end of the current month will show a considerable decrease from the previous month as it is unlikely that the volume of orders placed will show a material increase in the near future.

Argentine Railway Development.—The Argentine government's program for construction of new lines includes a proposal to survey a route for a railway joining up the northeast section of the North Argentine Railway with a point on the line between Rio Cuarto and Villa Dolores.

Supply Trade News.

Richard S. Buck has resigned his position with Sanderson & Porter, New York, to become chief engineer of the Dominion Bridge Company.

The H. W. Johns-Manville Company, New York, has moved its Newark, N. J., office to 329 Halsey street, where 4,000 sq. ft. of floor space is available.

A. B. Chadwick has resigned his position in the shops of the Armour Car Lines at Meridian, Miss., to go to the Grip Nut Company, Chicago, as superintendent of its plant at Whitney, Ind.

At a recent meeting of the directors of the Weir Frog Company, Cincinnati, Ohio, B. W. Rowe, the former president, was elected chairman of the board of directors, and O. DeG. Vanderbilt, Jr., was elected president in his place.

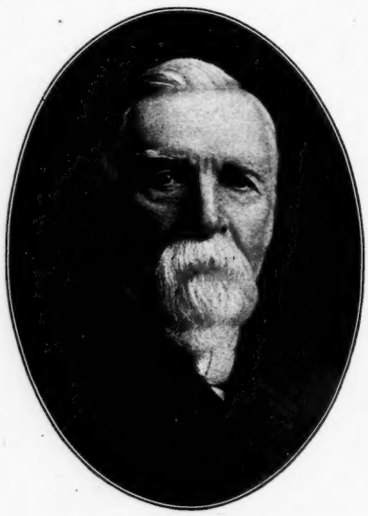
Erle C. Cowgill has resigned as secretary of The M-C-B Company, McCormick building, Chicago, to become general manager of a plantation company in Mississippi. His interest in The M-C-B Company was taken over by other members of the firm.

The Griffin Wheel Company, Chicago, has been reincorporated under the laws of Massachusetts, and has increased its capital stock from $10,000,000 to $21,000,000, of which approximately $15,000,000 has been issued. The company has been an Illinois corporation.

The Armour Car Lines are enlarging their car shops at Meridian, Miss. Additional trackage, machinery and buildings are being added to allow a force of 300 men to be at work rebuilding cars. These improvements are in charge of P. D. Galarneau, superintendent.

The O. M. Edwards Company, Syracuse, N. Y., has been incorporated with $1,000,000 common stock and $250,000 seven per cent. preferred stock to make among other things freight car equipments, including padlocks, valves, etc. The officers are as follows: President, O. M. Edwards; first vice-president, W. A. Le Brun; second vice-president and assistant manager, E. W. Edwards; and secretary-treasurer, J. J. Edwards.

John Fritz, pioneer ironmaster and one of the first to introduce the Bessemer process in this country, died at his home in Bethlehem, Pa., on February 13 at the age of 91. Mr. Fritz was born in Chester county, Pa., on August 21, 1822. He received his early education in a country school and became an apprentice in a blacksmith shop in 1838. In 1844 he went to a mill for rolling bar iron at Coatesville, Pa., still serving as an apprentice. After three months he was made a mechanic, and three months later he was given charge of the industry as ironmaster. In 1852 he was associated with a brother and two brothers-in-law in the establishment of a small foundry and machine shop at Catasauqua, and two years later he assisted in the construction of the Cambria Iron Works at Johnstown. In the same year he was made superintendent of that company. In 1860 he was called upon to design the plant of the Bethlehem Iron Company. He accepted, and when the plant was completed he was made superintendent and engineer. It was there that he helped perfect the Bessemer process, which was introduced in 1864. He was one of the very first to recognize its significance, and a large



John Fritz.

measure of its success is due to him. In 1886 Mr. Fritz built for the Bethlehem company a plant for the manufacture of armor plate, which was the first plant of its kind in this country. He introduced processes from England and France for the manufacture of this product. He resigned his position as president of the Bethlehem Steel Company in 1893 and retired from active business. Mr. Fritz was a vice-president of the American Society of Mechanical Engineers from 1882 to 1884, and was president in 1895. He had also been president of the American Institute of Mining Engineers, and was an honorary member of the American Society of Civil Engineers. In 1893 he was awarded the Bessemer medal by the Iron and Steel Institute of England, and in the same year was elected an honorary member of that institute, one of the greatest honors an engineer can receive. His eightieth birthday was celebrated by a dinner given in his honor at the Waldorf-Astoria, New York, on which occasion the John Fritz gold medal for achievement in educational sciences in this country was founded. This medal is awarded annually by a committee of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers. The first medal was conferred upon John Fritz himself. Mr. Fritz understood thoroughly every branch of the iron and steel industry, and his great value lay in his genius for organization, his ability to improve upon methods and his capacity for handling men.

Weber H. Arkenburgh has resigned his position as general signal inspector of the Chicago, Rock Island & Pacific, and is now in the publicity department of the Union Switch & Signal Company, Swissvale, Pa., with office at that place. Mr. Arkenburgh was born at Orange, N. J., in 1880, and after graduating from Williams College in the class of 1902 with the degree of A. B., entered railway service as a laborer in the signal department of the Delaware, Lackawanna & Western. Since that time he has been in the service of the Gulf, Colorado & Santa Fe, the Union Pacific, the Hall Signal Company, Garwood, N. J., the Long Island Railroad, and the Chicago, Rock Island & Pacific. In 1908 he did some special work on the Signal Dictionary for the *Railway Age Gazette*. Mr. Arkenburgh organized the Chicago Signal Club in 1910, was president part of that year, and vice-president the next year, and secretary and treasurer during 1912.

W. H. Arkenburgh.

TRADE PUBLICATIONS.

FROGS.—The P. & M. Co., Chicago, has issued a leaflet of tables of turn-out dimensions, together with instructions for their use by a short method for accurately locating frog points.

NATIONAL UNION OF RAILWAY MEN.—A cable despatch from London, February 14, says that under the title of the National Union of Railway Men the three principal unions of railway employees in Great Britain have been amalgamated. The new organization absorbs the Amalgamated Society of Railway Servants, the United Pointsmen and Signal Men's Union, and the General Railway Workers' Union. These societies have about 200,000 members. The despatch says that the executive officers of the new union will be invested with authority to begin and terminate strikes according to their own judgment, without taking a ballot of the members.

Railway Construction.

CENTRAL RAILWAY OF CANADA.—An officer writes that work will be continued in the spring on the line from Montreal, Que., west via Hawkesbury, Ont., Carleton Place, Fenelon Falls and Orillia to Midland, 342 miles. C. J. Wills & Son, Montreal, are the contractors. About 30 miles is ready for tracklaying. No grade will exceed 6/10 of 1 per cent. and no curve will exceed 8 deg. There will be 12 or more large bridges on the line, also freight and passenger terminals at Montreal and elevators and wharves at Midland. Arrangements are being made with the government to permit the Intercolonial to use the company's tracks through Ontario to the Lakes. Senator Owens is president, and F. Stuart Williamson, chief engineer, Montreal. (November 29, p. 1062.)

CHICAGO, BURLINGTON & QUINCY.—The contract for the line from Orin Junction to Powder River, Wyo., 108 miles, the closing link in the new route between Denver and Billings, has been let to Twohy Brothers, of Portland, Oregon.

FARMINGTON & OAKLAND INTERURBAN (Electric).—This company has asked for incorporation in Maine, with a capital of $300,000, to build from Farmington east via New Sharon, Mercer and Smithfield, thence south to Oakland, about 40 miles.

GREAT NORTHERN.—This company has made surveys for building an extension from Plentywood, Mont., west via Scobey.

HEMINGFORD & WESTERN.—Under this name a company is being organized in Nebraska to build from Hemingford, Neb., west to a point in eastern Wyoming. D. W. Butler, Hemingford, is to be president and general manager.

HOOPPOLE, YORKTOWN & TAMPICO.—Incorporated in Illinois with $100,000 capital and office at Hooppole. The plans call for building from Hooppole, in Henry county, Ill., northeast via Bureau county, to Tampico in Whiteside county, about 15 miles. The incorporators and directors include C. W. Groves, J. Ringel, G. R. Mathis and J. Tonkinson, of Hooppole; J. H. Cooley and J. W. Mathis, of Tampico, and R. H. Mathis, of Prophetstown.

MISSISSIPPI NORTHWESTERN.—An officer writes that the company expects to let contracts in about 90 days. The plans call for building from Biloxi, Miss., via Carthage and Yazoo City to Gaines Landing, Ark. The maximum grades will be 1 per cent. and the maximum curvature 6 deg. W. G. Seaver, president; J. M. Searles, chief engineer. (September 27, p. 599.)

NACOGDOCHES & SOUTHEASTERN.—This company, operating a 20-mile line from Nacogdoches, Tex., to Dunham, is planning to build a three-mile extension to a connection with the Angelina & Nechez River. P. A. McCarthy & Sons, consulting engineers, Lufkin, have made surveys and estimates.

NIAGARA FALLS, WELLAND & LAKE ERIE (Electric).—According to press reports surveys will be started soon for a line to connect Fort Erie, Ont., with Fort Colborne and other towns in Ontario. The headquarters of the company will be at Welland.

NORTHERN PACIFIC.—A contract has been given to the Cook Construction Company for grading work on an extension from Stanton, N. Dak., west on 68 miles.

OKLAHOMA, NEW MEXICO & PACIFIC.—According to press reports surveys are now being made from Ardmore, Okla., west to Waurika, and grading work has been started. J. L. Hamon, Ardmore, is interested. (October 18, p. 775.)

OKLAHOMA PACIFIC.—An officer writes that arrangements are being made to secure capital and the prospects of building are favorable at this time, but the date of letting contracts for construction, etc., has not yet been decided upon. The projected route is from Denver, Colo., southeast through the Panhandle of Oklahoma and Texas and Oklahoma to Oklahoma City, thence through the northeast corner of Texas and the southwest corner of Arkansas to Texarkana, Ark., and across Louisiana to New Orleans, over 1,000 miles. The principal bridges to be constructed include one across the Red river near Texarkana, and one over the South Canadian river near Oklahoma City. The company expects to develop a traffic in lumber, livestock, grain, cotton, ore and coal. V. A. Clark is president, Arnett, Okla.

Pacific Coast.—Incorporation has been asked for in the Dominion of Canada, to build from Hardy Bay to Suquash on Vancouver Island, B. C., about 12 miles. Also to operate steamship lines from Hardy Bay. Bernard & McKeown, Montreal, Que., are solicitors for the applicants.

Palmetto Railway (Electric).—Under this name a company is being organized in South Carolina, it is said, with a capital of $500,000. The plans call for building from Columbia, S. C., northwest via Prosperity, Newberry, Clinton and Laurens to Greenville, about 100 miles. A. J. Christopher, W. L. Gray and E. S. Hudgins, Laurens, S. C., are interested.

Quanah, Acme & Pacific.—An officer writes regarding the extension west of Roaring Springs, Tex., that nothing has been done toward extending the line beyond that place. Work was started last September on the extension from Paducah west to Roaring Springs, 40 miles, and at the present time over 1,000,000 cu. yds. of material has been moved and about 5,000 cu. yds. of concrete work completed. It is expected that the line to Roaring Springs will be opened about May 15. The Texas Building Company has contracts for grading, bridge and concrete work. The maximum grade will be 1 per cent. compensated for curvature and the maximum curves will be 4 deg. (February 7, page 271.)

Raleigh, Western & Atlantic.—Application has been made in North Carolina for a charter, it is said, to build from Bunn, N. C., southwest to Raleigh, thence northwest to Durham, about 50 miles. J. H. Pou, Raleigh, may be addressed.

Rio Grande Valley Traction.—According to press reports a contract has been given to Dudley & Orr, El Paso, Tex., to build from Washington Park, El Paso, to Ysleta, 10 miles. (January 17, p. 132.)

Toronto Eastern.—Construction is now under way, it is said, from Bowmanville, Ont., west to Pickering, 19 miles, and surveys are being made for an extension from Pickering west for 12 miles. E. W. Oliver is chief engineer, Toronto, Ont.

Tullahoma, Lynchburg & Fayetteville (Electric).—An officer writes that contracts are to be let about April 1 to build from Tullahoma, Tenn., on the Nashville, Chattanooga & St. Louis west via Cumberland Springs, Lynchburg and Mulberry to Fayetteville. The power will be generated at Manchester where the company will have a waterpower plant, using the waters of the Little and Big Duck rivers. There will be 14 small bridges on the line and a 218 ft. trestle. W. D. Cummings is engineer in charge, Manchester.

York & Oxford (Electric).—Incorporation has been asked for in Maine to operate a line from Sanford, Me., to a connection with the Boston & Maine and the Atlantic Shore Line, thence north through the towns of Alfred, Waterboro, Limerick, Cornish, Baldwin and Hiram to a connection with the Maine Central and the Bridgton & Saco River railroads, about 40 miles. The capital of the company is not to exceed $500,000.

RAILWAY STRUCTURES.

La Grange, Ga.—An officer of the Atlanta, Birmingham & Atlantic writes that bids are wanted for putting up a brick veneer passenger station one story high, 30 ft. x 116 ft., between Depot and Main streets in La Grange. The cost of the improvement will be about $12,000.

Lewistown, Mont.—The Great Northern is making plans for a station to be built at Lewistown.

Macon, Ga.—An officer of the Central of Georgia writes that the company has submitted a proposition to the authorities of the city of Macon to put up a passenger station to be 250 ft. long; also a freight station at the foot of Cherry street, in Macon. Definite plans to carry out these improvements have not yet been made.

Sudbury Junction, Ont.—The Canadian Northern has been authorized to build bridges in Ontario as follows: Across Jackfish river, mile 314 from Sudbury Junction; across Goose river (first crossing), district of Sudbury, mile 171 from Sudbury Junction; and across Kabinakagami river, district of Algoma, mile 286 from Sudbury Junction.

Railway Financial News.

Baltimore & Ohio Chicago Terminal.—This company has given the Minneapolis, St. Paul & Sault Ste. Marie a contract providing for the Soo, which now gets into Chicago over the Illinois Central tracks, to use the Grand Central Station of the Baltimore & Ohio Chicago Terminal.

Baltimore & Ohio.—The Public Service Commission of Maryland has applied to the circuit court of Baltimore for an injunction against the issue by the Baltimore & Ohio of $63,250,000 4 per cent. 20-year convertible bonds. The company has refused to ask permission of the Maryland Public Service Commission fearing that it may lose some of the benefits of an act of the Maryland legislature allowing exemptions by which the Baltimore & Ohio saves something in taxes.

Choctaw, Newcastle & Western.—B. R. Stevens, representing, it is said, the stockholders and creditors of this road, has filed an application in the superior court of Oklahoma for the appointment of a receiver, alleging indebtedness amounting to $9,000. This road runs from Alderson to Cambria, Okla., three miles.

Denver, Northwestern & Pacific.—The United States district court at Denver, Colo., has authorized the receivers to issue $750,000 6 per cent. receivers' certificates. The proceeds of the sale of these certificates are to be used to pay for new equipment.

Interborough Rapid Transit.—Stockholders are to vote on March 5 on the question of authorizing a mortgage to secure an issue of $300,000,000 5 per cent. 53-year bonds to provide for expenditures under the Rapid Transit contracts which are being finally passed upon by the New York Public Service Commission, First district.

Minneapolis, St. Paul & Sault Ste. Marie.—See Baltimore & Ohio Chicago Terminal.

Missouri, Kansas & Texas.—The bill which had been passed by the Texas legislature permitting the merger of the Texas Central with the M. K. & T. has been vetoed by Governor Colquitt on the ground that it is unconstitutional.

Pennsylvania Railroad.—President Rea has made the following statement

"The question of Pennsylvania Railroad financing for 1913 has not received the consideration of the board of directors and probably will not for some weeks to come.

"It is the policy of the Pennsylvania management to make public declaration of any purposes it may have in the direction of new financing at the earliest practicable moment after such policy is decided on. In all cases where an issue of new stock is to be made, such issue is always announced immediately after the meeting of the board of directors, which takes action on such propositions. It is not the policy of the management to comment on irresponsible rumors concerning its intentions. The public may rely, therefore, on the fact that any statements concerning the Pennsylvania Railroad's financing which are not announced by the company are wholly speculative and suppositious."

Pittsburgh, Cincinnati, Chicago & St. Louis.—The Ohio Public Service Commission has authorized the issue of $4,000,000 consolidated mortgage bonds for new construction and equipment, and $3,000,000 consolidated mortgage bonds, to retire Steubenville & Indiana 5 per cent. bonds maturing January 1, 1914.

Seaboard Air Line.—This company has sold $6,000,000 3-year 5 per cent. notes secured by $10,000,000 refunding bonds. The proceeds of the note sale are to be used for additions and betterments and to reimburse the treasury for capital expenditures. (December 6, 1912, p. 1076.)

Southern Pacific.—The syndicate agreement made by Kuhn, Loeb & Co. with about 500 other participants, which provides for underwriting the stock of the Southern Pacific which is to be offered to Union and Southern Pacific stockholders, contains no provision by which participants agree to hold stock off from the market longer than April 5.

Texas Central.—See Missouri, Kansas & Texas.